FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 105
No. 2195
Registered at the G.P.O. as a Newspaper

NOVEMBER 6, 1958
Offices: John Adam House, John Adam St., London, W.C.2

Single Copy, 1/-. By Post 1/4. Annual Subscription, Home 52/-, Abroad 60/- (Prepaid)

UNIVERSITY OF MICHIGAN
NOV 24 1958
ENGINEERING LIBRARY

G K

GUEST KEEN IRON & STEEL COMPANY

for

FERROUS & NON-FERROUS

CASTINGS

For All Industries

Made with the experience and skill gained by generations of craftsmen at the famous

DOWLAIS WORKS

Telephone: DOWLAIS 70

GUEST KEEN IRON & STEEL COMPANY LIMITED

Head Office: EAST MOORS, CARDIFF

Telephone: CARDIFF 33151

DSDALE & CO. LTD.

NEWHAM HALL MIDDLESBROUGH

SAND TESTING EQUIPMENT

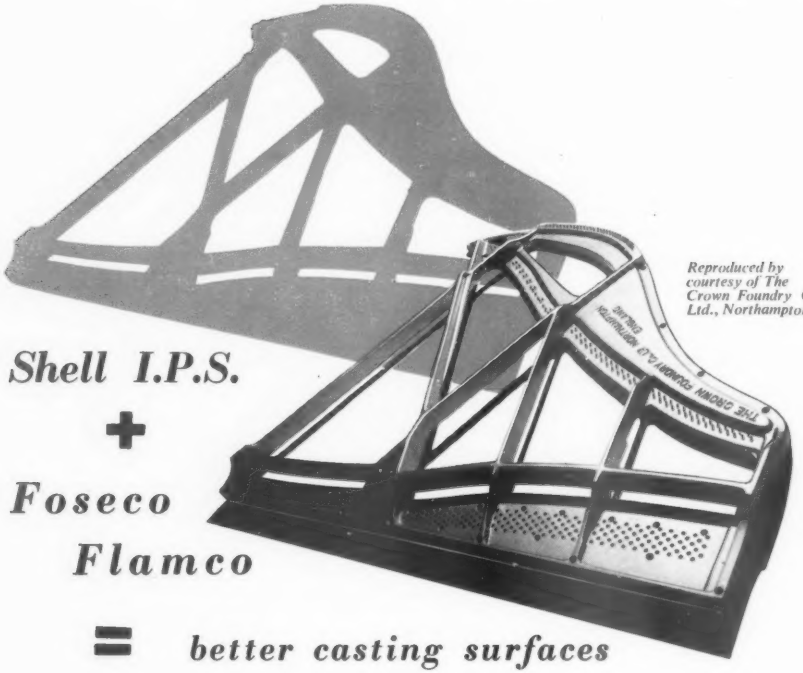
BRITISH LICENCEES H. W. DIETERT CO. U.S.A.

PRICE'S FIREBRICKS

As used by all the leading Iron and Steelworks and Foundries at Home and Abroad

Manufactured by

J. T. PRICE & CO. LTD., STOURBRIDGE



Reproduced by courtesy of The Crown Foundry Co. Ltd., Northampton.

Shell I.P.S.

+

Foseco Flamco

= ***better casting surfaces***

For the Foundryman who makes up his own mould and core dressings and takes genuine pride in his work, two really first-class products are available:

Foseco FLAMCO—the finest graphite dressing in powder form, designed for use with . . .

Shell I.P.S.—top-quality isopropyl alcohol.

Together they ensure smooth, even burning to give the best possible finish to castings at the lowest possible cost.

Send for details without delay.

Foseco

SHELL

FOUNDRY SERVICES LIMITED · LONG ACRE · NECHELLS · BIRMINGHAM 7

Telephone: EASt 1911 (10 lines) Telegrams: "KUPRIT Telex Birmingham"

Sole distributors of I.P.S. 1 and I.P.S. 2 to the Foundry Industry in the United Kingdom and Republic of Ireland for Shell Chemical Company Ltd.

FOUNDRY TRADE JOURNAL

Vol 105. November 6, 1958 No. 2195

Established 1902

Incorporating

IRON & STEEL TRADES JOURNAL

Single copy 1s.; *by post* 1s. 4d.

Annual subscription: home 52s., *abroad* 60s. (*prepaid*)

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.

Commercial Editor: P. E. CARDEN.

Advertising Manager: F. BARRINGTON HOOPER, B.A.

Production Manager: R. J. LOVELL

Publisher: H. J. DWYER

Circulation Manager: E. T. GRIFFITHS

District Representatives:
G. P. ELLIOTT (Northern Area)
T. H. SMITH (Scotland)

The FOUNDRY TRADE JOURNAL is the official organ of the British Steel Founders' Association; Association of Bronze & Brass Founders; Light Metal Founders Association; Foundry Trades' Equipment & Supplies Association; and the National Society of Master Patternmakers.

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Every Thursday by Industrial Newspapers, Limited

BARRINGTON HOOPER, C.B.E.
Chairman and Joint Managing Director

F. BARRINGTON HOOPER, B.A.
Joint Managing Director and Commercial Director

F. R. LEWIS, JOHN HOOPER, D. HORN
Directors

E. G. WESTON,
Director and Secretary

JOHN ADAM HOUSE,
17-19, JOHN ADAM STREET,
ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 (*Private Branch Exchange*)
Telegraph Address: "Zacatecas, Rand, London."

PRINCIPAL CONTENTS

Page

Modified Keel-block Design for Acceptance Testing of Ductile Iron

By Gilbert McGlothlin

The article describes the control problem which arose when an American foundry commenced experimental production of ductile iron in 1948. It was found that conventional test-bars of the kind used for grey iron were unsatisfactory and that a modified form of the keel-type block would have to be designed to meet the more complex requirements of the new material 563

British Cast Iron Research Association

Annual Report for the Year ending June 30, 1958 567

Salvage of Iron Castings by Welding

By José Carlos Pellegrino

Summary of results obtained from arc welding specimens from automobile castings in comparison with gas-welding at similar locations .. 573

GIFS Meeting

Discussions of papers presented at a meeting of the Gray Iron Founders' Society held recently in Washington 575

Dessin modifié d'un Bloc en Forme de Quille pour les Tests d'Acceptance de la Ductile. Par Gilbert McGlothlin.
Cet article décrit le problème du contrôle qui a surgi lors du début de la production expérimentale de la ductile dans une fonderie américaine en 1948. On découvrit que les barreaux-éprouvettes conventionels de l'espèce utilisée pour la fonte grise n'étaient pas satisfaisants et qu'il serait nécessaire de modifier le dessin du bloc en forme de quille pour répondre aux éxigences plus complexes de ce nouveau matériau 563

British Cast Iron Research Association.
Rapport annuel de l'association britannique de recherches sur la fonte pour l'année finnissant le 30 juin 1958 .. 567

Réparation de Pièces en Fonte par Soudure. Par Jose Carlos Pellegrino.
Résumé des résultats obtenus de la comparison entre des specimens de pièces pour automobiles soudé à l'arc ou au gaz, mais à des endroits semblable 573

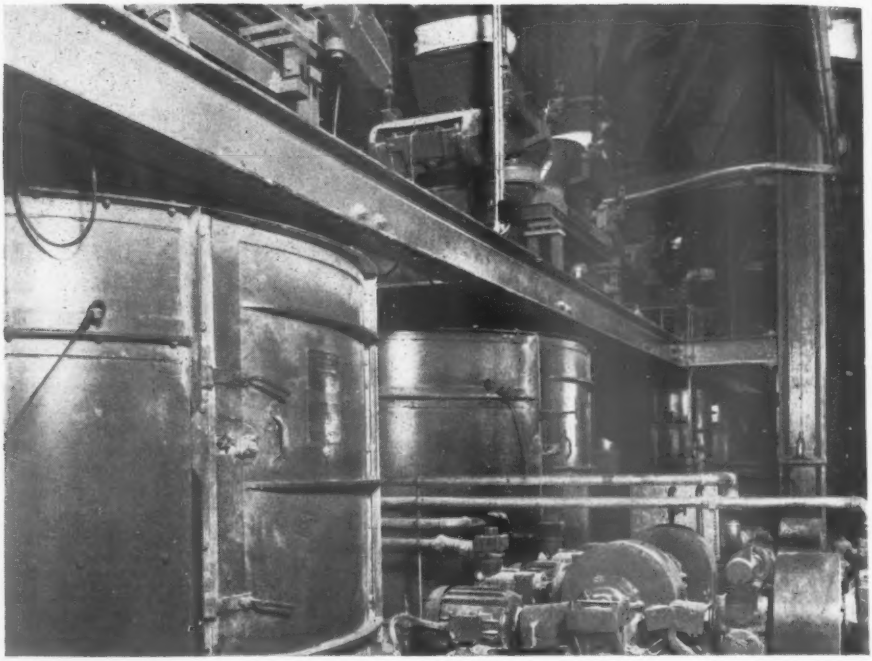
Eine geänderte Kielblockform für Abnahmeproben von Kugelgraphiteisen. Von Gilbert McGlothlin.
Der Artikel beschreibt das Prüfproblem, das auftrat, als eine amerikanische Giesserei im Jahre 1948 die versuchsweise Erzeugung von Kugelgraphiteisen begann. Es wurde gefunden, dass die für Gusseisen herkömmlichen Probestäbe ungeeignet waren und dass eine geänderte Kielblockform erdacht werden musste um den verwickelten Erfordernissen dieses neuen Werkstoffes gerecht zu werden 563

British Cast Iron Research Association.
Jahresbericht des britischen Gusseisenforschungsinstitutes für das Ende Juni 1958 ablaufende Geschäftsjahr .. 567

Ausbesserung von Graugussstücken durch Schweissung. Von Jose Carlos Pellegrino.
Zusammenfassung von Ergebnissen, die an im Lichtbogen geschweissten Probestücken von Kraftwagengussteilen im Vergleiche mit Gasschmelzschweissung an gleichen Stellen erzielt wurden . 573

Features, News, Commercial Information, and Statistics

Leader: Steel Castings Research Convention 561
Dinners 562
Forthcoming Events 562
Castings for Tougher Jobs 566
Sheffield IBF Jubilee Celebrations 566
Iron and Steel Institute 572
Census of Production for 1958 572
Lancashire Branch Innovation 572
American Letter 578
Company News 579
New Patents 579
Contracts Open 579
Personal 580
Obituary 581
News in Brief 582
Imports and Exports of Iron and Steel 586
Raw Material Markets 588
Current Prices of Iron, Steel and Non-ferrous Metals 590



Photograph by courtesy of the FORD MOTOR CO. LTD.

AUTOMATION in Core Sand Mixing

AT THE NEW FORD FOUNDRY

An impressive batch of four August-Simpson Mix-Mullers for Core Sand Mixing Plant—Large size 2F—each Mix-Muller having a batch capacity of 2,000 lbs.

Each Mix-Muller is charged by means of an overhead batch hopper in conjunction with an automatic weighing plant.

The charging operation and sequence for material and liquid additions, length of mixing cycle, and discharge mechanism are automatically controlled.

Sole Licensees and Manufacturers for the British Empire (excluding Canada, Australia and New Zealand) of the Simpson Sand Mixer.

HALIFAX · ENGLAND

Telephone: Halifax 61245/6/7/8 **Telegrams: August, Halifax**

August's LIMITED

J.J.M.

FOUNDRY
TRADE JOURNAL

Vol. 105 NOVEMBER 6, 1958 No. 2195

Steel Castings Research Convention

The enthusiasm for technological knowledge in the steel foundry industry is of a very pronounced character. This was brought into high relief by the conference organized by the British Steel Castings Research Association and held at Harrogate, as the attendance of steelmakers and metallurgists was between two and three per steel foundry. If either iron or the non-ferrous foundries showed equivalent support, then Olympia would be needed to house such a conference. Moreover, the BSCRA is unique amongst research associations catering for the metallurgical industries insofar as it annually organizes a conference to discuss technical topics of mutual interest to its members and to tell them of work being undertaken. Mr. C. H. Kain, the chairman of the Association, was able to report the great progress achieved since the quite recent opening of the new research station.

The "star" lecture of the conference was given by Mr. Charles W. Briggs, the technical director of the Steel Founders' Society of America. He took for his subject "Deoxidation and Degassing of Cast Steel." A few decades ago, sulphur was the bugbear of the steelfounder. To-day this has been replaced by hydrogen, and current thought in America is that this should be controlled at a figure lower than 2.2 ml. per 100 gm. A paper which aroused much interest was by Mr. E. W. Sanders and Mr. M. A. Totham. It dealt with the graphite-rod resistor furnace, which compared with most types of electric furnace is, we gather, cheap to instal, but lacks some of the advantages of the more conventional type. During the discussion, it was stated that 200 of this type of furnace had been installed in Germany for melting down iron turnings and the like. Another remark in the discussion which impressed us came from Dr. J. Keverin of the (American) General Electric Company; it was to the effect that carbon at high temperature, but under vacuum conditions, shows enhanced activity as a deoxidizer.

When Dr. Sully, the director, reviewed the researches now being undertaken by the BSCRA, he described a machine that had been developed for the testing of shotblast grit. This unique piece of apparatus has every appearance of being able to provide useful data, alike for maker and user. Discussion was very frank, and even a question such as "If you had your time over again would you still instal this plant?" received an equally candid reply. These technical meetings are of outstanding value to the steelfoundry industry and in this respect, this section of the industry is more fortunate than other major branches. The steelfounders' annual conference well merits the great support it attracts.

Dinners

PRESIDENT'S DINNER

Mr. G. E. Lunt, then president of the Foundry Trades' Equipment & Supplies Association, was host to the members of Council at a dinner held at the Hyde Park Hotel, London, S.W.1, on October 28.

"AT HOME"

Mr. J. E. V. Jobson (chairman, Qualcast, Limited) entertained a large company of guests, many of whom were connected with the foundry industry, at a cocktail party at the Dorchester Hotel, London, W.1, on October 29.

INSTITUTION OF PRODUCTION ENGINEERS

The Rt. Hon. the Earl of Halsbury was in the chair at the annual dinner of the Institution of Production Engineers held at the Dorchester Hotel, London, on October 29. With him at the high table were Sir William Black; Sir Maurice Dean, K.C.B., K.C.M.G.; the High Commissioner for Ceylon; the Rt. Hon. the Lord Hives, C.H., M.B.E.; the Rt. Hon. the Lord Nathan; Sir Thomas Padmore; Sir Walter Puckey; Sir R. Owen Jones, K.B.E., C.B., A.F.C.; Sir Arnold Hall, F.R.S.; Major-General K. C. Appleyard, C.B.E., D.L.; Mr. H. Burke; Mr. H. J. Furness; His Excellency, the Rt. Hon. Sir Eric J. Harrison, K.C.V.O.; Mr. H. E. Honer; Mr. R. E. Huffam, M.C.; Mr. J. D. Scaife; Dr. E. C. Smith; Mr. H. S. Syrett, C.B.E.; Mr. R. H. S. Turner, and Mr. H. Wilmot, C.B.E.

During the evening, the following awards were presented: the George Bray Memorial Lecture, 1957, to Dr. V. E. Yarsley; the Sir Alfred Herbert Paper, 1957, to Dr. H. Barrell; the Viscount Nuffield Paper, 1957, to the Rt. Hon. the Lord Hives, C.H., M.B.E.; the Lord Sempill Paper, 1958, to Mr. Boyd K. Bucey; the E. W. Hancock Paper, 1958, to Mr. Lewis T. Wright; the Institution Medal (for members) to Mr. J. A. Grainger; the Institution Medal (for non-members) to Mr. A. G. Thompson; the Schofield Travel Scholarship, 1957, to Mr. J. D. Parson, and the Lord Austin Prize, 1957, to Mr. J. F. Percival. Finally, Mr. H. E. Honer, honorary member and founder of the Institution, presented to the president, for safe-keeping on behalf of the members, a bound volume of documents relating to the foundation of the Institution.

JUBILEE DINNER

The 50th aniversary celebrations of the Sheffield branch of the Institute of British Foundrymen included a dinner/dance, on November 1, at the Grand Hotel. Mr. F. Cousans presided and with him at the high table were Mr. and Mrs. Humphries, Mr. and Mrs. A. E. Peace, Mr. and Mrs. V. C. Faulkner, Dr. and Mrs. Dadswell, and Mr. and Mrs. Freer. In a gracious speech, Mr. J. F. Stanier proposed the health of the ladies, which was replied to by Mrs. Humphries in a speech of distinct charm.

Marking Imported Refractories

A Draft Order in Council prescribing additional methods of indicating the origin of imported refractory bricks, blocks, and tiles not made from molten material, so as to meet the requirements of modern methods of production, was laid before Parliament last week. The Order is intended to extend the provisions at present prescribed in the Merchandise Marks (Imported Goods) No. 4 Order, 1930.

Forthcoming Events

NOVEMBER 8

Institute of British Foundrymen

East Midlands branch: "Production of an Automobile Cylinder-head Casting," by L. W. Bolton, 6 p.m., at the College of Technology and Commerce, Leicester.

NOVEMBER 10

Institute of British Foundrymen

Lancashire branch: "Practical Experiences of Making Moulds in a Mechanized Foundry," by H. Pinchin, 7 p.m., at the Midland Hotel, Manchester.

Institute of Metals

Scottish local section: "Practical Application of Cathodic Protection in the Marine Field," by J. K. H. Tait and R. J. Thurbon, 6.30 p.m., at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.

NOVEMBER 11

Incorporated Plant Engineers

Manchester branch: "Radio-isotypes in Industry," by W. G. Busbridge, 7.15 p.m., at the Engineers' Club, Albert Square, Manchester.

Institute of British Foundrymen

Coventry and district section: "Coreblower Operation," by G. W. Fearfield, 7.30 p.m., at the Coventry Technical College, Room A.5.

NOVEMBER 11-12

Combustion Engineering Association

Annual conference at the Royal Hotel, Scarborough.

NOVEMBER 12

Incorporated Plant Engineers

Western branch: "Education in Industry," by E. G. Sterland, 7.15 p.m., at the Grand Hotel, Broad Street, Bristol.

NOVEMBER 13

Incorporated Plant Engineers

North-east branch: "The Gas-turbine," by H. R. Beaton, 7 p.m., at Roadway House, Oxford Street, Newcastle-upon-Tyne.

Southampton Metallurgical Society

"Recent Developments in Magnesium-base Alloys," by D. J. Whitehead, 7.15 p.m., in the Small Physics Lecture Theatre of the University, Southampton.

NOVEMBER 14

Manchester Metallurgical Society

"Machining of Large Light-alloy Components by Computer Control," by J. Gregson and A. Flett, 6.45 p.m., at the Engineers' Club, Albert Square, Manchester.

Institute of British Foundrymen

Bristol and West of England branch: "Economic Production of Castings by the Shell-moulding Process," by J. E. Worthington, 7.30 p.m., at Newman Hender & Company, Limited, Woodchester, Stroud, Glos.

"Clean Air"

Papers on the subject of Clean Air are to be presented and discussed at a meeting of the Combustion Engineering Association, to be held at the Park Hotel, Cardiff, on Wednesday, November 19. At the morning session, commencing at 11 a.m., Mr. J. Lawrence will speak about "Smoke Abatement," and this will be followed by a break for luncheon at 1 p.m. The meeting will re-commence at 2.15 p.m., with a paper entitled "Grit- and Dust-collecting Equipment," which will be presented by Mr. G. Oddy. Further details are available from the honorary secretary of the Western Region of the Association at Babcock & Wilcox, Limited, 26, High Street, Cardiff.

THE FUND for the Scottish Industries Exhibition to be held in Glasgow next year has already exceeded the 1954 record figure of £131,000.

Modified Keel-block Design for Acceptance Testing of Ductile Iron

*By Gilbert McGlothlin**

With the emergence of ductile iron as a commercial proposition in 1948 *the Lynchburg Foundry Company inaugurated an experimental production project which commenced operation the following year. It was found in the company's control laboratories, however, that the material required more complex physical testing procedures than did grey iron and that, as a consequence, an unconventional form of rest-bar or block would have to be utilized. The "keel" type test-block, used throughout the steel industry, was chosen for this purpose, but it was not until two modifications had been made that an entirely satisfactory design was obtained. In what follows the nature of the original problem and the means adopted towards its solution are concisely described.*

When ductile iron gained attention on the American foundry scene in May, 1948, it created widespread interest on the part of producer and consumer. The physical properties of the metal in the "as-cast" state, or those which might be imparted through controlled heat-treatment, suggested its application in many fields heretofore untouched by existing types of cast iron. It was fully realized throughout the foundry industry that a period of experimentation had to precede widespread use of ductile iron in order to find solutions of the many problems encountered in its manufacture.

Lynchburg Foundry Company began experimental production of ductile iron at the Radford and Lynchburg plants in 1949. The metallurgical control laboratories found the physical testing procedures for ductile iron to be more complex than those required for grey iron. Due to the characteristics of ductile iron a form of test-bar or block, other than the conventional ASTM† types used for grey iron, was necessary to obtain a sound test specimen entirely free of centreline shrinkage. The ASTM "Y" and "keel" type test-blocks used generally by the steel industry came into use for this purpose.

The "keel" type test-block consists essentially of a block of iron about 8 in. long with two protruding legs which are parallel for its full length. These so-called legs, when removed, become test coupons X in square by 8 in. long. The value of X will be ½ in., 1 in. or larger depending on the section thicknesses of the castings involved. This type test block is shown in Fig. 1.

The "Y" type test-block is very similar in nature and is so named because its end view resembles the letter "Y". Test coupons are taken from the leg portion of the block. The top part of the "Y" serves as a feeder throughout solidification to prevent any porosity in the leg. A view of this type test-block can also be seen in Fig. 1. Both types of test-blocks are poured with the legs downward. The leg, or test coupon, is parted from the block body by a milling operation and is placed in a lathe where a tensile test specimen is turned. The specimen is threaded or shouldered on both ends depending on the type of holder used in the testing machine, with the two and one quarter inches in the middle highly polished to a final diameter of 0.505 in. See Fig. 2.

The use of the keel block for test purposes was expensive and laboratory results were delayed by excessive time involved in removing the legs from the body of the block. The operation required a machine to saw or mill the legs, or the use of a shaper to part the leg from the body. Few laboratories have such facilities within their own department and this makes it necessary to depend on machining departments to perform this operation. Machine-shop scheduling created a bottleneck which in turn delayed physical testing results and made evident the need for a simplified test-block.

First Modification

It was believed that a keel block could be designed to satisfy all testing requirements and simplify machining operations which in turn would help in obtaining test results sooner. Various modifications were considered and work was begun to evaluate a modified version of the keel block. The modified design employed the 1 in. ASTM keel block dimensions, and by the use of a wafer-core arrangement, similar to the Washburn risering technique, a parting notch was cast in the side of the keel permitting either, or both, legs to be knocked off with a heavy hammer blow. This modification is shown in Fig. 3.

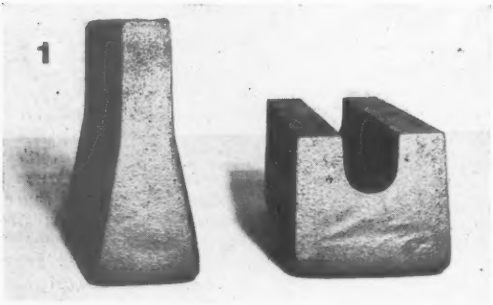
The wafer-core opening was found to be critical. If the width of the opening was reduced below ¼ in., shrinkage was detected in the test coupons; whereas a wider opening to correct for shrinkage made it difficult or impossible to remove test coupons with a hammer. Experimental tests made by comparing the modified keel block with the standard ASTM keel block disclosed similar physical properties.

Second Modification

The chief disadvantages of the first modified keel block were: (1) The legs had a tendency to warp. (2) A clean breakoff of the leg was seldom obtained due to the uneven line of cleavage and this created a problem in the lathe operation. With the knowledge that a wafer-core opening with a width of

* The author is cupola foreman to the Lynchburg Foundry Company. The article is reprinted by courtesy of *The Iron Worker*, copyright by Lynchburg Foundry Company, Lynchburg, Va., USA.

† American Society for Testing Materials.



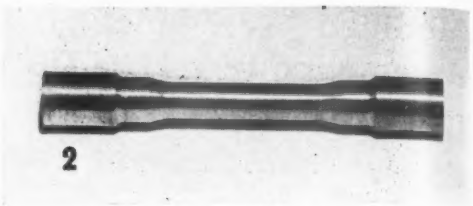


FIG. 1.—*(top left) Comparison between ASTM (American Society for Testing Materials) one-inch "Y" block (left) and one-inch "keel" block.*

FIG. 2.—*(top right) Ductile-iron test-specimen after turning and polishing, ready for tensile test.*

FIG. 3.—*(bottom left) The first modification of the standard keel-block.*

¼ in. would successfully feed each leg, an effort was made to further improve the modified block by substituting one in. round legs for the one in. square ones. The one in. round bar would provide a more efficient shape for the lathe and offer the distinct advantage of less stock to be removed in turning a tensile specimen. It was found that a $\frac{3}{16}$ in. feeder connection was sufficient to produce a sound specimen. The design of this block was then such that the round leg would shear away cleanly upon impact of a hammer blow.

This modification, when perfected, looked very promising insofar as surface imperfections, internal soundness, and shape. Fig. 4 shows the round-leg block pictured alongside the conventional square leg type. In Fig. 5 the core used to form the round-leg keel block is shown. Fig. 6 is a drawing showing the dimensions of the modified keel block core.

When the dry-sand core-mould is poured completely full of iron there will be no shrinkage in the two legs. It is important that the small thin wafer core be glued securely and held in its proper position. If it is not, the centre portion will break loose and float when the cavity is filled with iron. The legs then become a major part of the block which renders it useless.

Comparison of Physical Properties

Work on this project had now reached the point for evaluating the merits of the modified version. A series of tests were made comparing physical properties of the metal obtained from an ASTM one in. keel block with those from the modified round-leg block. Comparison test specimens were poured from the same ladle of ductile iron. A comparison of physical properties can be seen in Fig. 7. The ultimate tensile-strength values of the modified keel block were consistently three to five per cent. less than those obtained from the ASTM keel block. In most cases the difference in values for yield point, per cent. elongation and reduction in areas were negligible. During this develop-

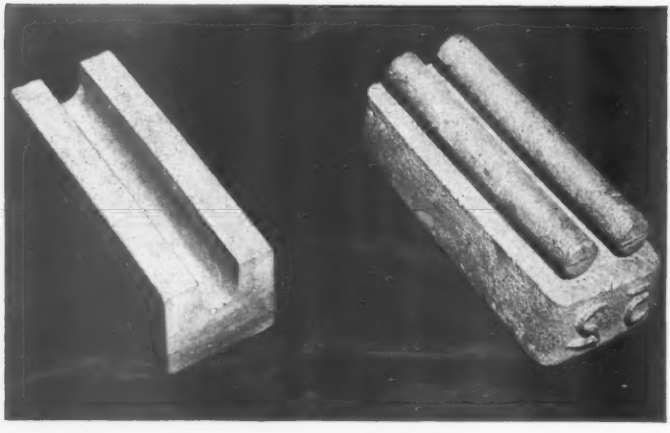


FIG. 4.—*Comparison between the ASTM one-inch keel-block (left), and the modified one-inch round leg keel-block (right).*

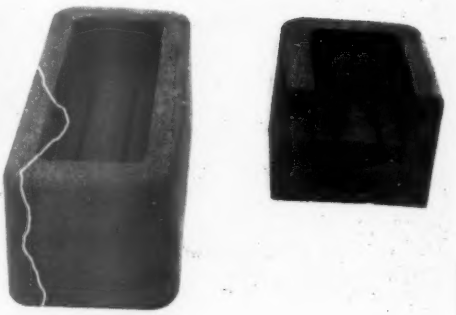


FIG. 5.—*Round-leg keel-block core (left), ready for pouring, and a section of this core.*

ment period a number of modified keel blocks were poured and tested by other foundries whose reports verified our own findings.

Approval for Keel Block

The tabulated results were submitted to the Lynchburg Foundry Company metallurgical department for evaluation and possible acceptance. In June 1955 approval was given for use of the modified keel block in all cases "except where specifications called for ASTM one in. keel-blocks or other specific test specimens." Limited use was begun almost immediately. Because of the convenience involved, it was well received by the laboratory.

The time saved by (1) eliminating a machine operation in separating the legs from the body of the block (16.8 min.) plus (2) decreased time interval in lathe operation due to less stock resulting from a round leg, proved a substantial saving. There was no way to place a monetary value on the saving in time required for physical analysis of a given ladle of ductile iron and the subsequent release of same for shipment.

The modified keel block has been in regular use at Lynchburg Foundry Company for the past two years. The minor faults have long since been discovered and corrected. It is now a well-

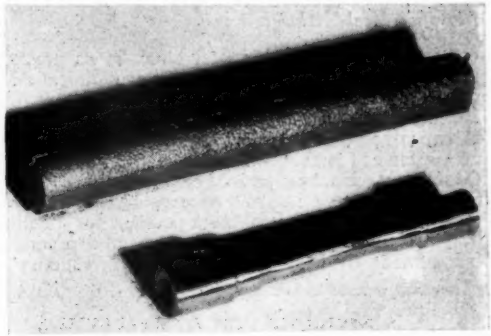


FIG. 8.—*Round leg from the modified keel-block showing the ductile-iron test specimen as taken from it. The specimen is ready to be placed in the tensile testing machine.*

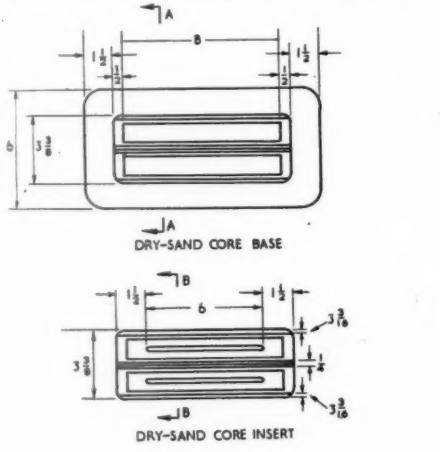


FIG. 6.—*Drawing showing dimensions of the modified keel block core (with round legs), and in two parts.*

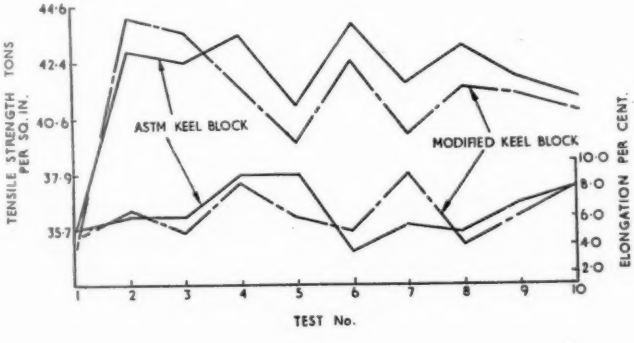


FIG. 7.—*Comparison between tensile strength and elongation in the ASTM keel-block, and in the Lynchburg modified keel-block (round leg).*

Modified Keel-block Design

established fact that this keel block in its present stage of development offers a most economical and efficient form of test-block for ductile iron control. Exploration of potential applications of ductile iron has been continuous since its experimental production began at Lynchburg Foundry Company in 1949. Continuous, also, has been the emphasis on economy and efficiency in all phases of production and testing. The modified keel-block design for ductile iron acceptance tests is indicative of the progress being made by the company in this direction.

Metallurgical Abstract

Castings for Tougher Jobs. C. F. JOSEPH. (*Metal Progress*, 1958. Vol. 73; No. 5; pp. 104-8.) Pearlitic-malleable iron is opening up new horizons for cast parts in automobile and other applications. Chromium is counteracted by the use of boron in amounts of 0.001 to 0.004 per cent. Boron allows a higher percentage of chromium in the iron without detrimental effect. Also it speeds up the annealing cycle in heat-treating the white-iron casting. The annealing time has been reduced by one-third by using 0.003 per cent. boron. Boron is added to the cupola charge in 50 per cent. ferro-silicon-alloy (containing 0.050 to 0.060 per cent. boron). Boron produces much smaller temper carbon spots which aids materially in machinability, without appreciably affecting the physical properties of the metal.

Additions of small amounts of bismuth prevent the formation of primary graphite in castings 2 in. or larger in cross-section. For medium-size castings, 0.005 per cent. Bi is used and up to 0.02 per cent. for large castings. Heat-treatment is done in atmosphere-controlled radiant-tube furnaces 120-ft. long by 18-ft. wide. Neutralene gas is used to maintain a high-nitrogen atmosphere. The atmosphere in the furnace has no free oxygen, has up to 15 per cent. CO, and less than 1 per cent. CO_2, the balance being nitrogen.

Heat-treatment is conducted in two steps, namely:—(1) the malleablizing treatment of the white-iron casting which is conducted at 927 to 955 deg. C. for 10 hr. or more, so breaking down the massive cementite. This is followed by rapid air quenching from about 870 deg. C. (2) The castings are tempered to a uniform Brinell hardness by heating for about 4 hr. from 675 to 720 deg. C. The properties of pearlitic-malleable iron differ according to the amount of combined carbon in the matrix, and, by controlling this, the mechanical properties can be varied over a wide range. The use of oil quenched and tempered pearlitic malleable iron is increasing due to better uniformity of castings, higher physical properties, and improved machinability.

A MEETING of the Powder Metallurgy Joint Group of the Iron and Steel Institute and the Institute of Metals is to be held on December 16 and 17 at Church House, Great Smith Street, London, S.W.1, when there will be a symposium on "Powder Metallurgy of Ceramic/Metal Materials."

Sheffield IBF Jubilee Celebrations

The golden jubilee celebrations of the Sheffield branch of the Institute of British Foundrymen opened at the Mappin Hall last Friday night with a lecture from Lord Hives, Mr. Frank Cousans presiding. On the platform with him were the deputy Lord Mayor of Sheffield (Alderman A. Ballard); the vice-chancellor of the University, Dr. J. M. Whitaker, and Dr. C. J. Dadswell. In his speech, Lord Hives mildly attacked foundry owners for taking insufficient interest in the training of its future technologists, saying that they only gave "lip service." This, he said, must be replaced by real enthusiasm. It was unfortunate, he went on to say, that the degree course in foundry practice, established by Sheffield University in the years between the wars, had been abandoned, either because industry didn't support it or because there were insufficient technical problems in the foundry—the latter, he submitted, was inadmissable. Most students working for a "dip. tech." award were taking "sandwich" courses comprising six months in a college and six months in a works. Yet, of 1,360 students there was none from the foundries. Most of the universities were recognizing the dip. tech. award as being of honours degree standard and, therefore, those obtaining the award were eligible to participate in post-graduate studies.

Mr. Cousans, in thanking all those who had helped to make the evening the undoubted success it was, mentioned Mr. V. C. Faulkner, Editor of the FOUNDRY TRADE JOURNAL, who was a founder member of the Sheffield branch, and a pioneer in the production of electric steel.

On the Saturday morning a visit was made to the Staveley Iron and Chemical Company, Limited, as this was the first foundry to be visited after the creation of the branch. Luncheon was served in one of the works' canteens and thereafter—instead of the horse-drawn brake drive through Derbyshire, which was a feature of the visit years ago—there was a motor-coach tour. A halt was made at the Maynard Arms Hotel, Grindleford, for tea. Later a dinner/dance was held at the Grand Hotel, which is formally reported elsewhere in this issue.

Sheffield and Clean Air

Sheffield City Authorities have been given to understand that they may be successful in their application to have control—through their own inspectors—of industrial smoke, dust and fume emissions, under the Clean Air Act. A letter recently received by the Sheffield and District Clean Air Committee from the Ministry of Housing and Local Government, states that "The Minister believes that a large and competent local authority employing public health inspectors qualified and experienced in smoke prevention and possessing the smoke certificate of the Royal Society of Health or its equivalent, and a local authority, moreover, which has a tradition of interest and successful action in relation to air-pollution problems in its district, can reasonably claim to control processes which give rise to what are essentially questions of fuel combustion." Sheffield Health Committee decided on October 27 to seek the Ministry of Housing and Local Government authority for the establishment of three more smoke-controlled zones in the city. These are in addition to the one already sanctioned.

COCHRAN & COMPANY, ANNAN, LIMITED—Col. W. Wallace has been appointed to the board.

British Cast Iron Research Association

Annual Report for the Year ending June 30, 1958

The British Cast Iron Research Association held its annual general meeting at the Connaught Rooms, London, last Tuesday, when the following report covering the year's activities to June 30 was presented:—

At the annual general meeting of the Association held in London on November 5, 1957, Mr. E. Player, C.B.E., was elected president. The vice-presidents were elected for a further year with the exceptions of Lord Mills of Studley, P.C., K.B.E., who relinquished office on becoming a Minister of the Crown, and Mr. H. J. V. Williams, who retired in accordance with Article 24. Mr. S. H Russell, C.G.I.A., undertook the duties of hon. treasurer following the retirement of Mr. E. P. Major, F.C.A., from that office, and Mr. H. J. V. Williams was elected Chairman of Council in succession to Mr. S. H. Russell. Mr. J. J. Sheehan, B.SC., and Mr. Major were elected honorary members of the Association.

General

During the year the Council, under the chairmanship of Mr. H. J. V. Williams, held six meetings, and 11 meetings were held by the advisory committee. The main committees of the Council held 16 meetings. Mr. P. A. Russell, B.SC., F.I.M., succeeded Mr. A. E. Peace as chairman of the research board and research committee in January, 1958. Mr. R. L. Handley continued as chairman of the information committee, and Mr. R. Taylor as chairman of the Scottish committee. Mr. W. Brindley succeeded the late Mr. C. Gresty as chairman of the foundry atmospheres committee, and Mr. G. R. Buckley succeeded Mr. H. J. V. Williams as chairman of the development committee.

Twenty-one meetings were held by the sub-committees and panels of the main committees of Council, making a total of 54 meetings in all during the year. The Association is much indebted to its Council, committee and sub-committee members for their services.

The income and expenditure account for the year ended June 30, 1958, and the balance sheet as at June 30, 1958, accompanied the report. Income at £200,321 is £2,450 greater than for the preceding year, and is the highest figure recorded in the Association's history. Grant-earning income has again exceeded £120,000, thereby enabling the Association to earn the maximum Government grant of £56,000. The Association is indebted to the Joint Iron Council for subscribing the major part of grant-earning income, £114,557.

Revenue expenditure has risen from the previous year's figure of £160,312 to £175,449. Staff additions and the introduction of the high-frequency furnace are the main reasons for the increased expenditure. The excess of income over expenditure for the year is £24,872, and of this amount £22,500 has been transferred to the buildings and equipment fund, the balance of £2,372 being added to the general fund. The balance sheet shows that the net value of fixed assets is now £168,259, and current assets at £186,068 give an excess over current liabilities of £173,046. The buildings and equipment fund now stands at £247,500 and the general fund at £93,805.

Capital expenditure during the year amounted to £37,715. Commitments in respect of outstanding orders for capital items at June 30, 1958, amounted to £67,234. During the year which commenced July 1, 1958, it is anticipated that revenue expenditure will approach closely to the income figure and as a result of capital expenditure already planned, net current assets at June 30, 1959, will be reduced to approximately £100,000. The next quinquennium commences July 1, 1959, and it is apparent that to enable activity to continue at the current level and to provide for the first stage of a new laboratory block, additional funds are necessary. The Council is giving urgent consideration to alternative methods of raising the additional income required.

Personalia

The "visitors" appointed by the Department of Scientific and Industrial Research, Mr. E. W. Colbeck, M.A., F.I.M., technical director of Hadfields, Limited, Sheffield, and Professor A. J. Murphy, principal of the College of Aeronautics, Cranfield, visited the Association on April 1 and August 19, 1958. Professor A. J. Murphy also visited Alvechurch on October 3, 1957.

The Council has announced the appointment of Mr. I. C. H. Hughes, M.SC., A.I.M., as assistant research manager, Mr. E. R. Evans, A.I.M., A.C.T. (Birm.), as laboratories superintendent, and Mr. R. I. Higgins, B.SC., as leader of the foundry dust and ventilation experimental section.

The president of the Association, Mr. E. Player, C.B.E., and the director, Dr. J. G. Pearce, C.B.E., represented the Association at the luncheon which followed the annual meeting of the parliamentary and scientific committee held in London on February 26, 1958.

The director, Dr. J. G. Pearce, acted as one of the judges at the European Apprentice Competition held at Stuttgart, November 25 to 30, 1957. Dr. H. T. Angus represented the Association at a meeting of the Cast Iron Committee (TC/25) during the conference of the International Organization for Standardization at Harrogate, June 16 to 19, 1958. Congratulations are extended to two members of Council for honours conferred by the Institute of British Foundrymen, the E. J. Fox gold medal to Mr. P. A. Russell, and the Oliver Stubbs gold medal to Mr. M. M. Hallett.

Research Department

The work of the research committee has continued under the supervision of the research board,

BCIRA Annual Report

the research committee and its sub-committees: engineering castings, malleable cast iron, white and chilled iron, sands and refractories, methods of analysis, fuels and furnaces, and light castings. A special panel appointed by the research board has supervised the Association's work on dephosphorization.

Mechanical Properties of Cast Iron

An extensive programme of tests on the suitability of many different types of cast irons for steam engineering applications is in progress and growth tests on 35 materials at temperatures from 250 to 500 deg. C. for periods up to 64 weeks have been completed. It has been found that growth is largely determined by the amounts of pearlite-stabilizing residual elements present. Tensile tests are carried out on the growth specimens. Growth and scale tests have also been made on specimens exposed in steam at various power stations. Creep machines have been installed for testing those materials that show the least growth.

In connection with an investigation of factors influencing the mechanical properties of grey cast irons, the effect of phosphorus has again been comprehensively examined. The effect of nucleation of the melt on the properties of the resultant cast irons has also been studied. To study the factors determining the stress/strain curve of grey cast irons, the mechanism by which plastic deformation occurs has been investigated; the effect of plastic deformation on modulus of elasticity has also been examined.

Since the standard Swedish tensile test-piece with no parallel portion was reported to give higher tensile strength values, in high-strength irons, than standard British test-pieces with a parallel test length, the effect of mild notches on the tensile strength of grey cast irons has been investigated.

Soundness of Iron Castings

Problems associated with the factors governing the soundness of iron castings continue to absorb the effort of a group of investigators. It has been shown that the design of the casting and of the gating system influence sinking defects in bosses in thin plates; the suggestion that this effect is due to their influence upon metal temperature distribution is now being examined. The influence of degree of eutectic nucleation on soundness has been investigated and the effects of a number of foundry variables have been shown to result from their influence on nucleation. Field tests on the relation between nucleation and soundness have been carried out and are continuing.

The technique of quenching partially-solid castings to study their solidification sequences has been extended to cover a white iron, and has revealed important differences in the solidification of white and grey cast irons. This method is being used to investigate the influence of superheating and pouring temperature.

Work has shown that the effects upon shrinkage of mould rigidity and of pouring temperature are interdependent, and an extensive study of these two variables is under way. Shrinkage defects in small nodular-iron castings and in high-phosphorus flake-graphite irons have been eliminated by the use of sufficiently rigid moulds.

A method for studying dross in nodular-iron castings has been developed; the principal factors influencing this defect have been investigated, enabling recommendations to be put forward for minimizing defective castings from this cause. A study has been made of K-bar test-castings of various sizes to elucidate the influence of design factors on soundness. Following conflicting reports of the effect of carbon and of carbon equivalent on the soundness of iron castings, a study of the influence of carbon content on the soundness of unfed castings of relatively heavy section has been carried out.

Moulding Sands and Core-sands

The examination of the properties of clay-bonded sands at high temperatures using the existing dielectric heater continues, and high temperature tests are now successfully used, together with the standard routine temperature tests, in solving members' problems. The equipment in its present form is limited in application, since the maximum heating rate is lower than is desirable and the strength of some clay-bonded sands, and most sands containing organic binders, is above the present limit. It has been shown that faster heating is possible with the equipment now available and the construction of a new heating unit is nearing completion. The design of a testing unit with greater capacity is under review.

Investigation of the sodium-silicate/CO_2 Process has shown that the rate of the allotropic changes of silica on heating is accelerated by the presence of sodium silicate and this has been studied in detail in relation to the behaviour of moulds during casting. Work on the moulding properties of clay-bonded sands has continued and the programme has been extended to include creep of sands with organic binders under very low loads.

Analytical Techniques

Research on methods of chemical analysis has been proceeding along three main lines: (1) The improvement of existing methods for the routine analysis of cast iron and ferro-alloys. This work is carried out in co-operation with the Methods of Analysis sub-committee. The first part of the "Handbook of Selected Methods" is ready for publication. The members of the sub-committee are now engaged in an extensive investigation of methods for the analysis of ferro-alloys. (2) Methods for the analysis of slags. The first stage of this investigation has been completed and comparatively rapid and accurate methods for all the constituents of cupola slags are now available. Attention is now concentrated on the development of more rapid methods. (3) The analysis of trace elements. Methods for aluminium and cobalt have been completed; methods for the determination of traces of boron and cerium are under investigation. Work continues on the development of routine methods for the spectrographic analysis of slags.

White and Chilled Cast Irons

A study has been made of the factors which cause white irons to solidify with the eutectic in an acicular form or in a typical ledeburitic form. The effect of treatment of the melt with various inoculants and the effect of superheating have been studied by means of cooling curves.

Relationships between chill depth and mottle spread in chill test-castings of differing sizes, cast from metal with differing degrees of eutectic nucleation, have been studied and thermal analyses have been made of the castings produced. This work continues. Work on hot tearing is still in progress; it has been directed to studying the influence of test-casting design, in order to enable commercial conditions to be simulated. An investigation of the effect of chromium on the properties of irons of normal chilled-roll composition has begun, and a study of the constitution and properties of 15 to 35 per cent. chromium irons is also under way.

Malleable Cast Iron

An investigation of the influence of graphitization and of manganese and sulphur content on the rate of decarburization has terminated. Work on the influence of phosphorus on the strength and ductility of blackheart-malleable cast iron forms part of a wider programme intended to provide basic information for establishing specifications for malleable cast iron. Similar work is in progress on pearlitic-blackheart-malleable cast iron. Work on the occurrence of inverse greyness in malleable iron has continued.

Work on the effect of the ratio of carbon dioxide to carbon monoxide on sulphur penetration, during the occurrence of the peeling defect in whiteheart-malleable iron has enabled an explanation to be put forward of the differing results obtained by previous workers.

Corrosion

With the co-operation of the British Shipbuilding Research Association, the Association continues to study the application of cathodic protection to prevent pitting of cast-iron propellers. Co-operation with engine manufacturers on the corrosion of diesel-engine waterways by anti-freeze solutions continues.

Graphite Formation

Considerable progress has been made in defining the factors that affect the graphite structure in terms of their influence on the nucleation and growth of the eutectic. The effect of these variables on undercooling and nucleation characteristics has been studied. New explanations have been developed for the effects of sulphur, hydrogen and tintanium in cast iron.

Phosphorus in Foundry Pig-Irons

Large-scale trials of the Kaldo top-blowing process have demonstrated its suitability for the production of low-phosphorus iron from high-phosphorus molten pig-iron. A detailed examination has been made of the relative costs of the Kaldo top-blowing process, the L-D top-blowing process, the basic converter process and the German rotor process, for the production of low-phosphorus foundry pig-iron.

Fuels and Furnaces

Work has begun on the installation of a specially-designed experimental hot-blast cupola which is planned to go into operation early in 1959.

Gases in Cast Iron

Work on hydrogen pick-up from the mould and its relation to pinholing tendency has continued, with special attention to the effect of aluminium in high-manganese pearlitic-malleable cast irons. Because the presence of aluminium in ferro-silicon is found to encourage pinholing, a comprehensive investigation has been begun on the influence of other elements on the inoculating power of ferro-silicon.

Further work has been carried out on the effect on malleablizing resulting from treatment of the melt with hydrogen. The effect of hydrogen in increasing the annealing rate has been demonstrated by eliminating the hydrogen during the anneal under vacuum conditions. The effect of residual hydrogen has been demonstrated by introducing this element electrolytically. Further work has been carried out on the influence of shotblasting on carbon-monoxide evolution during the vitreous-enamelling process.

Ingot Moulds

The Association continues to co-operate with the British Iron and Steel Research Association in investigating factors influencing the production and lives of ingot moulds. In co-operation with several ingot-mould producers the relation between sand-mould rigidity, soundness, and feed metal requirements, has been investigated. The routine examination of ingot moulds continues. An attempt has been made to establish the normal mode of occurrence of phosphide eutectic in ingot moulds and to determine the manner in which the structure of a mould varies in different positions.

Development Department

The development department has maintained contact with member-firms and engineering users. There has been little change in the number of members availing themselves of the service of the foundry section, but there has been a marked increase in the number of enquiries received. The number of member-firms visited was nearly 50 per cent. higher than in previous years. The types of problem submitted have shown some changes; for example, there is an increasing demand for assistance to reduce overall foundry scrap rather than scrap occurring with specific castings. Advice on the production of higher-grade irons is also frequently requested.

Engineering works have, as before, asked the Association for advice on the types of iron required for particular castings, and on the design of castings. Typical problems submitted during the year have concerned the wear and stressing of diesel-

BCIRA Annual Report

engine components, especially liners and pistons, and the development of brake materials for specialized applications. A study has also been made of materials for glass-bottle moulds, with the object of improving the service life.

Reference was made in the last annual report to the establishment of a joint cupola-coke-quality committee, of which Dr. H. T. Angus, manager of the department, is chairman. Mr. F. Dunn and his staff have been investigating the breakdown of cupola coke during transport for this committee and have completed the first series of tests. This work is continuing. An investigation by Mr. A. D. Morgan on the identification of dross and slag defects occurring in grey-iron castings is in progress. Apparatus has been constructed for work on the hardenability of cast iron. Equipment is also available for testing the machinability of cast iron.

For part of the period the work of the department was carried out under some difficulty due to the departure of three members of the staff to take up industrial appointments. The staff has now been restored to its usual strength, and continues to represent the Association on committees of the Council of Ironfoundry Associations, the British Standards Institution, the International Standardization Organization, the Institute of British Foundrymen, the British Coke Research Association and the British Steel Castings Research Association.

Foundry Atmospheres Section

The foundry atmospheres section is now under the direction of Mr. W. B. Parkes. The new building to house the section is expected to be available later in 1958. For the first time the staff will have full facilities, which will include instrument rooms and a very large open laboratory in which full-scale ventilation air-movement tests can be carried out. The former head of the experimental section, Mr. W. D. Bamford, has left to take up a position elsewhere, and has been replaced by Mr. R. I. Higgins. Mr. Bamford's detailed work on dust control at the knock-out will be published shortly. As a result of greatly improved facilities the Foundry Atmospheres section will be in a much better position to carry out investigations on prototype extraction systems, and also to study in greater detail the whole problem of dust production, dispersal and control.

The advisory section, under Mr. W. H. White, which deals with external enquiries about smoke and grit emission from furnaces and dust control in fettling shops, has been kept very fully occupied as a result of the Clean Air Act. The staff has paid 75 visits to works in addition to giving a large number of lectures.

Scottish Laboratories

The Scottish laboratories, under Mr. A. N. Sumner, which carry out advisory work in the Scottish region, have also shown a very marked increase in inquiries, both from foundries and from users of iron castings. These laboratories are now equipped with a small experimental foundry so that the range of work possible has been substantially increased.

Foundry Operations Section

With the approval of the Council, the operational research team has been re-named the foundry operations section. During the year under review some 55 visits have been made to foundries to give advice on production methods and foundry lay-out. Seventeen of these visits have been return visits made at the request of the firms concerned; in several cases diagrammatic lay-outs for mechanized plants have been put forward.

The application of work-study techniques is being pursued, and during the year two members of the section attended a short course on the subject held under the auspices of the industrial operations unit of the Department of Scientific and Industrial Research. A study of labour performance for cupola charging has been completed and a report prepared. Additional equipment has been obtained for memo-motion photography and this aspect of methods engineering promises to be of exceptional interest and value. At present it is being used as a tool for the investigation of snap-flask and plate-moulding methods, but it is hoped to extend its field of application as more experience is acquired.

Intelligence Department

Publications

A total of 23 reports has appeared in the BCIRA *Journal* during the year. The BCIRA *Bulletin* has contained its customary features and among the additional articles there have been reviews of literature on industrial noise, foundry education in the United Kingdom and overseas, and a French glossary of foundry terms. Members of the staff have contributed papers to other organizations and technical journals and these have been made available to member-firms in the form of external reports. A number of lectures has also been given by members of the Association's staff to technical institutions, educational bodies and other organizations, totalling 25 in all. Members of BCIRA staff have also contributed papers to conferences organized by the Institution of Mechanical Engineers on lubrication and wear, and by the British Glass Industry Research Association on glass-bottle moulds.

Conferences

A brief note was included in the last annual report on a conference planned to be held at Glasgow, primarily for the benefit of Scottish members and users of castings. This one-day discussion, devoted to the engineering properties and uses of iron castings, was held on October 10, 1957, under the chairmanship of Mr. R. Taylor. The total attendance was nearly 70.

A conference on the implications and requirements of the Clean Air Act, 1956, which came into force on June 1, 1958, was held at Ashorne Hill on July 7 and 8, 1958. It was organized jointly by

the Association and the Council of Ironfoundry Associations. A number of papers was given on the scheduled and non-scheduled furnaces, together with an account of some of the representative cupola-spark and -grit arresters available. The accommodation was fully taken up and those attending totalled 105, including staff. Sir Frederick Scopes, a former president both of the Joint Iron Council and of the Association, was present to welcome visitors to the conference.

Staff

The staff of the intelligence department was strengthened by the addition of a permanent translator in August, 1957, and during the year 64 translations have been added to the Association's collection, which has now reached a total of 826. To prevent overlapping in this field, the Association keeps in touch with the Iron and Steel Institute, and the Association of Special Libraries and Information Bureaux, who are notified of completed translations.

Exhibitions

The Association contributed to an exhibition held by Robert Taylor and Company (Ironfounders), Limited, in Glasgow from November 10 to 15, 1957. Material was also supplied to the Department of Industrial Metallurgy at the University of Birmingham to form the nucleus of a permanent exhibition there, and to the South African branch of the Institute of British Foundrymen for an exhibition celebrating the twenty-first anniversary of that branch.

The Association's film on side-draught ventilation was sent out by the department to 35 firms and other organizations and in all has been shown 41 times. Other films that have been borrowed by member-firms include "Dust Observations on a Wet De-coring Bar" and "External Dust Control for a Pedestal Grinder." A film record was made of the "open days" held in July, 1957 and is now in the process of being edited. Another film was made during the year at a Midland foundry to illustrate an old-established method (now dying out) for producing malleable cast iron in the crucible furnace.

Foundry Education

The four-day courses on moulding sands and core-sands for representatives of member-firms continue to be well attended; up to the middle of 1958 the intake of students totalled 600. At the request of member-firms in the South Wales area, a series of lectures on the metallurgy and properties of cast iron was presented at Swansea Technical College during October and November, 1957.

Membership and Staff

The total membership of the Association in all classes at the end of September, 1957, was 1,316. The total staff was 146, of whom 118 are employed in a scientific or technical capacity.

(The report is signed by Mr. E. Player, the president; Mr. H. J. V. Williams, the chairman of Council, and Dr. J. G. Pearce, the director.)

Hawthorn, Leslie increase Dividend

Demand for new tonnage has fallen considerably, but orders at present on the books of R. & W. Hawthorn, Leslie & Company, Limited, shipbuilders and engineers, of Newcastle-upon-Tyne, will fully occupy its establishments for some time, states the chairman, Sir Robin Rowell, in his annual review.

The directors are confident that the policy of bringing plant and equipment up-to-date should ensure the group obtaining its share of future work. Benefits would also derive from the further increase in the range of products through the acquisition during the year of a manufacturing licence for marine diesel machinery of the Stork type. It was hoped that the new steel-production sheds would be in operation in the spring of 1959, all the development having been achieved without any interference with shipbuilding output.

The dividend has been increased by 2½ per cent. to 25 per cent. and the group profit, before tax, is £1,545,452 (£1,119,741).

Acknowledged, with thanks . . .

G. Perry & Sons, Limited, have pointed out that the photograph of three pressure-cast patternplates used to illustrate the article in the JOURNAL of October 16 about extensions to their works (part Fig. 2, page 472) was reproduced by courtesy of Ainsbury Foundries, Limited. Permission to use this photograph is acknowledged, with thanks.

W. H. Allen Son & Company open New Works

Formal opening of the Atlas Works, Pershore (Worcs), of W. H. Allen Son & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford, took place last month when Admiral Sir William Tennant, Lord-Lieutenant of Worcestershire, unveiled a plaque in the new machine shop. The Bedford firm bought, modernized, and re-equipped the works at a cost of £500,000.

Many of the workers employed by the firm which formerly used the premises before its closure in 1955 have been re-employed, and apart from chief executive staff and skilled workers, all 220 employees have been recruited locally. A training scheme has been established to bring the employees up to the required standard for the company's production of gears, turbines, pumps, etc., and an apprenticeship scheme has also been set up.

STOKES CASTINGS, LIMITED, of Union Foundry, Mansfield, have recently started up a new combined decoring and shotblast plant. The blasting room itself is 14 ft. by 10 ft. by 9 ft. high and is served by one of the shop's ten-ton overhead cranes. This further installation of plant follows extensions recently made to accommodate a new boring and a new planing machine to take jobs up to 6-ft. wide. It is now possible for this old-established foundry to machine practically any casting that can be produced in their moulding shop.

Iron and Steel Institute

Eleventh Hatfield Memorial Lecture

Dr. N. P. Allen, F.R.S., superintendent of the National Physical Laboratory's Metallurgy Division, is to deliver the Eleventh Hatfield Memorial Lecture on December 9, at the Weir Lecture Hall of the Institution of Naval Architects, 10, Upper Belgrave Street, London, S.W.1, at 6 p.m. Dr. N. P. Allen was educated at Burton-on-Trent Grammar School and Sheffield University. Before becoming superintendent of the NPL Metallurgy Division in 1944, he worked at the British Non-Ferrous Metals Research Association, Birmingham University, and the Research and Development Department of the Mond Nickel Company, Limited. He was elected a Fellow of the Royal Society in 1956.

Autumn Meeting to be International

Some of the liveliest discussions during the recent *Journées Internationales de Siderurgie* in Belgium took place at Charleroi, when the subject was the continuous casting of steel. It was therefore decided to offer a platform for continuing this debate at the autumn general meeting of the Iron and Steel Institute on December 10 at the Weir Lecture Hall. There is to be an all-day meeting on that day at the offices of the Institute, 4, Grosvenor Gardens, London, S.W.1, beginning at 10.30 a.m., at which papers from Austria, Belgium, Canada, France, Germany, Switzerland, the United Kingdom, the USA., and the USSR are to be discussed. It is hoped to be able to show films of continuous casting in France, the UK, and the USSR during the course of the meeting.

In addition, there will be a session on creep in steel in the morning and a joint meeting with the Institute of Welding in the afternoon.

Vacuum Processes

"Vacuum Processes in the Iron and Steel Industry" is the theme of the 38th meeting of the iron and steel engineers' group of the Iron and Steel Institute (an all-day meeting, starting at 10 a.m.), which is to be held at the offices of the Institute, on December 11. In all, eight papers are to be presented and discussed, covering vacuum degassing and consumable-arc and vacuum-induction melting methods. The authors of these papers are from Belgium (Cockerill-Ougrée), Germany (Bochumer Verein and Dortmund-Hörder Hüttenunion), the United Kingdom (BISRA, Efco-Edwards, and William Jessops), and the USA (Bethlehem Steel Company and Utica Metals Division, Kelsey-Hayes Company).

Perkins' "Baby" Diesel to be made in France

Arrangements have been made for the manufacture in France of the new "baby" diesel engine made by F. Perkins, Limited, Peterborough. Bugatti of Paris is to manufacture the engine—the 1.6 litre Four 99—at its Molsheim factory on behalf of the UK company's French associate, Société Française des Moteurs F. Perkins.

Production of the engine is expected to begin soon and it is estimated that 5,000 will be produced in the first year and 12,000 in the second. It is reported that a number of French car and tractor manufacturers are interested in the Four 99, which is designed for installation in cars, taxis, light vans, small tractors, etc.

The Peterborough company announced last week that it had received an order for 102 Four 99 engines from its Hongkong distributors. They are to be fitted in taxis in Hongkong and Kowloon.

Census of Production for 1958

As already announced, a detailed Census of Production is to be taken in 1959 in respect of the year 1958. An Order prescribing the matters about which returns may be required has now been made by the Board of Trade. The Order, which operates from December 31, 1958, is the Census of Production (1959) (Returns and Exempted Persons) Order, 1958 (S.I. 1958, No. 1731).*

The 1958 Census will be the first detailed census to incorporate the changes recommended by the Committee on the Censuses of Production and Distribution under the chairmanship of Sir Reginald Verdon Smith. These changes include the following:—

(*a*) The "exemption" limit has been raised so that full particulars will be required only from firms employing 25 or more persons instead of from those employing eleven or more on productive work, as previously.

(*b*) The information asked for will correspond more closely than previously to what is covered by firms' ordinary records. For example, firms will no longer be asked to exclude from their census returns particulars of merchanted goods, or of ancillary services such as the operation of canteens.

(*c*) Combined returns may be made for two or more establishments of the same firm provided that the establishments are all in the same census industry, and all in the same country (*i.e.* England, Scotland or Wales).

The changes will mean that over 30,000 firms will be relieved from giving most of the information which was required at the last detailed Census (for 1954); the changes will also, it is hoped, enable those from whom detailed returns are still required to complete them more easily and return them more quickly.

* Copies may be obtained from H.M. Stationery Office, Kingsway, London, W.C.2, and branches or through any bookseller (price 3d., by post 5d.).

Lancashire Branch Innovation

Mr. E. Longden, past national and Lancashire branch president of the Institute of British Foundrymen, has instituted a new type of paper to be contributed to the branch and has offered certificates and books as awards for those annually adjudged the best. These awards will be given to authors for essays based upon an appraisal of the papers read before the Lancashire branch during the previous session and entries will be assessed by a committee. Three awards will be offered, *viz*:—First: Certificate and books to the value of £4: second: Certificate and books to the value of £2, and third, a certificate. This scheme will present an opportunity to members of the branch (particularly those who have little or no chance to enter into discussion at a meeting or who hesitate to venture an opinion) to comment on the technical content of the papers presented at meetings and add information from their own experience of the subject matter. By this new approach, it is hoped to recruit new contributors to the ever-broadening field of foundry techniques. The essays are to be of not more than 5,000 words, supported by illustrations. The awards will be presented by the branch president at the Lancashire annual general meeting or any other outstanding occasion deemed appropriate. The competition is confined to Institute members over 25 years of age and essays should be in the hands of the branch secretary not later than September 30 each year.

Salvage of Iron Castings by Welding

*By José Carlos Pellegrino**

For years foundrymen have been salvaging grey-iron castings by either gas-welding or brazing, although they realize that these two processes are not really economic, due to the great amount of time and cost of labour involved. A few are finding that arc-welding can do the job well and cheaply. The report which follows is a summary of the work done in the welding laboratory of General Motors Institute, and the results of the experiments are very encouraging.

The idea of repairing grey cast iron by arc-welding originally appeared as a possible economy over the high cost of gas-welding. There are quite a few castings which present some defect, and which can be salvaged and turned into good products. Blow-holes, sand-holes, pits, scabs, etc., are the chief defects encountered. These, however, can be rectified by welding and the usual procedure is to preheat the castings to a maximum temperature of 720 deg. C. for 1 to 3 hrs., and then either to gas-weld or braze them. Some of the heaviest jobs may require a pre-heat ranging up to 10 hrs.

This obviously involves much time, labour and cost. The equipment necessary for pre-heating and sometimes post-heating involves large furnaces; moreover, hoists, booms, chains, etc., are needed. The amount of time spent on this procedure may vary between 2 to 11 hrs., depending on several factors, such as the size of the castings, the extent of the defect, the quality of the repair to be done, the required accuracy, etc. Staff are needed in order to operate the furnaces and handle the castings properly. It is well known that average figures indicate a speed of 10 in. per min. for arc-welding, while for gas-welding the speed is reduced to 2.8 in. per min. Consequently, overall labour costs are cheaper for arc-welding.

Experimental Work

For the experiments a V-8 cylinder-head casting was used, cut into six parts, holes and cavities then being drilled on both machined and unmachined surfaces (Figs. 1 to 4). The shape of the holes and cavities were very much alike in each pair of samples, the purpose being to find the difference between gas-welding and arc-welding under identical conditions. The Brinell hardness was checked at several points of all samples. The readings were within a range of 4.0 to 4.3 mm. (diameter of impression). For clarity, those numbered 1, 2, and 3 were gas-welded samples, while 1a, 2a, and 3a were the arc-welded. Samples numbered 1, 2, and 3 correspond, roughly, to 1a, 2a, and 3a as far as the shape of holes and cavities was concerned.

Gas-welding

The first sample (Figs. 5 and 6) was pre-heated with a torch and then welded, by using a general-purpose cast-iron rod and a considerable amount of flux. No post-heating was applied. The time spent on the whole operation was 20 min. After machining, the sample showed much porosity; this could be attributed either to the lack of adequate pre-heat or poor welding technique.

The second and third samples were pre-heated in a furnace at 660 deg. C. for two hrs. Five minutes sufficed to weld each sample, using the same rod and a quantity of flux. Post-heat was then applied for four hrs. and the samples were allowed to cool slowly. Although the apearance of welds was not very good, especially on unmachined surfaces, they were perfect—no cracks, no slag inclusions and no porosity were found after machining. Brinell hardness readings on the weld and on the heat-affected zones were within a range of 4.0 to 4.4 mm. (diameter of impression).

Arc-welding

Samples 1a, 2a, and 3a were welded with an ac/dc rectifier set on reverse polarity, using direct current at 85 amps. The filler metal employed was a high-nickel-content electrode, $\frac{1}{8}$ in. dia. In order to reduce stresses in the welded joint, peening was done after each 1 in. or $1\frac{1}{2}$ in passes. Table 1 gives the times spent on the actual welding and for the whole operation.

TABLE 1.—*Arc-welding Times.*

Sample No.	Welding time (min.).	Total time. (min.).	Remarks.
1a	1	4	Big hole encountered.
2a	$2\frac{1}{2}$	7	
3a	1	5	

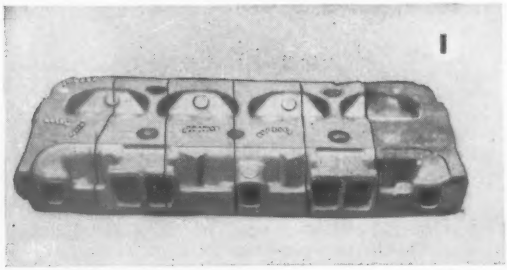
After machining the samples, the Brinell hardness was taken at several points of the weld, at the heat-affected zones, and at the parting lines of welds and heat-affected zones, giving results between 4.0 and 4.4 mm. (diameter of impression).

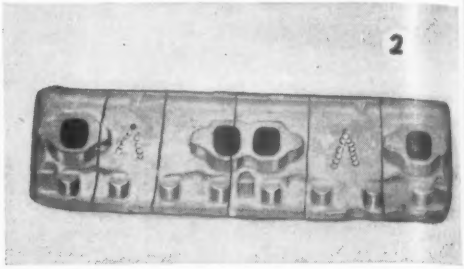
Advantages

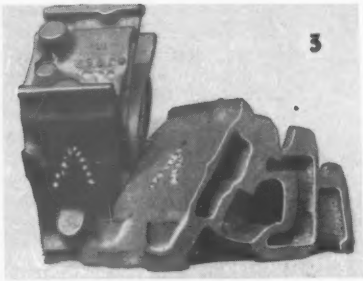
The following may be listed as the main advantages of arc-welding over gas-welding:—

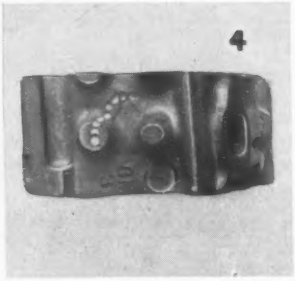
(1) *Reduction in Time:*—The fact that arc-welding does not require either pre-heat or post-heat makes it a faster process. Experience has shown that it is not always possible to do gas-welding satisfactorily without pre-heat, which involves *time*. Moreover, the speed of arc-welding is about

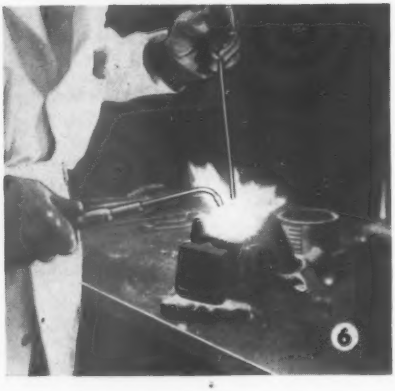
* The author is a graduate of the Engineering School, Mackenzie University, Sao Paulo, Brazil, and at the time of writing held a scholarship at the General Motors Institute in Flint, Michigan.











FIGS. 1 AND 2.—*Underside and top face respectively of a V-8 cylinder block casting cut into six pieces for the welding experiments.*

FIGS. 3 AND 4.—*Preparation for welding on faces to be left unmachined, and those where machinability was required.*

FIG. 5.—*Completed gas-weld, cut to indicate easy machinability.*

FIG. 6.—*Gas-welding in progress on one of the samples.*

three to four times faster than the working speed for gas-welding.

(2) *Lowered Labour Costs:*—Because arc-welding is the faster process, labour costs are lowered, since fewer man/hours are required. It must also be remembered that there is no labour involved in pre- and post-heating of the castings.

(3) *Equipment:*—It is true that the equipment for arc-welding is more expensive than that required for gas-welding. However, the maintenance of gas-welding equipment is somewhat dearer and, in addition, the process as applied to castings involves the installation of suitable pre-heating and post-heating furnaces.

Conclusion

Based on experiments, on past experience, and the good results obtained by those who have been using arc-welding as a process to salvage grey-iron castings, it can be stated that the cost of arc-welding is low compared with the present cost of gas-welding and brazing processes. Additionally important is the fact that arc-welding is a faster process and an easier one. The ultimate point is that the results are excellent.

In conclusion, the author acknowledges permission from General Motors to publish this account.

PUBLIC TRANSPORT SERVICES in India's largest city, Bombay, are to be augmented by 50 Leyland double-decker buses equipped with the "no-clutch" Leyland pneumo-cyclic gearbox. The contract has been placed with Ashok Leyland, Limited, by Bombay Electric supply and Transport Undertaking.

GIFS Meeting

Two discussions from the recent Gray Iron Founders' Society meeting, held in Washington D.C. from October 8 to 10.

Economic Evaluation of Melting Equipment

The opening discussion by Mr. James, of Urick Foundry, compared production costs of liquid metal in his firm with those of neighbouring foundrymen in the same geographical area.

Mr. Roth of Motor Castings contributed a survey of improvements in castings resulting from the installation of dehumidifying equipment. This installation, costing £11,000 in 1945, with an estimated value at double this cost in 1958, resulted in the elimination of 95 per cent. of the gas and porosity rejections, and accompanying castings problems, which were encountered in the period prior to the installation of humidity control equipment.

S.-g. Iron Melting

Mr. Ruf of Grede Foundries reported upon melting equipment changes which affected the production of s.-g. iron at his works. He said that the cost of the metal and coke charged probably accounted for 90 per cent. of materials costs. Mr. Ruf continued by saying that the basic lined cupola was ideal for the production of high-carbon cast irons. Its use assisted in removing the sulphur and, since the coke was not wetted, a higher carbon pick-up occurred. A basicity ratio of 2.6 (*i.e.*, per cent. CaO (lime) MgO: SiO_2 (clay) Al_2O_3) was considered desirable. With a higher basicity, a greater carbon pick-up occurred and the sulphur content was also reduced. A typical cupola mixture consisted of 900 lb. of steel, 700 lb. of s.-g. iron returns and 50 lb. of ferro/50 per cent. silicon. The melting required 225 lb. of coke plus 120 lb. of limestone to produce a temperature of 1,540 deg. C., and an iron composition of 3.9 per cent. T.C., 1.3 Si, 0.45 Mn, 0.025 S and 0.025 per cent. P.

Commenting upon the patching costs for the basic cupolas, Mr. Ruf said that these were considerably higher than for an acid cupola. The basic cupola would require 125 lb. of patch per ton of iron melted. This refractory would cost £21 per 2,000 lb. ton. In contrast, the acid cupola would use only 65 lb. of refractory per ton of iron melted at a cost of £5 per 2,000 lb. of refractory. The present practice of producing s.-g. cast-iron required a 58-in. bed of coke, with melting proceeding at a rate of 6.3 tons per hour and with a ratio of iron to coke of 6:5. Of this high coke input, approximately 50 lb. of coke per ton of iron was absorbed by the metal charge. Present practice operated on a charge of 38 per cent. steel scrap, 50 per cent. of ductile-iron returns, and 12 per cent. of high-silicon (silvery) pig.

Water-cooling System

Mr. W. O. Larson, Jr. reported extensively upon operating economies in his shop over the past decade. By way of introduction, he reported that his establishment produced about 800 tons of castings per month. They employed about 250 men, of whom 40 were moulders. The daily melt was about 40 tons which was processed through a 72-in. dia. shell cupola lined to 54 in. A front-slagging spout and a forehearth completed the metal receiving equipment. An air-blast system capable of delivering 7,500 c.f.m. at 54 oz. pressure represented an initial improvement in facilities.

In 1955 a water-cooling system was installed. The shell was pinched into a 60-in. dia. for a 60-in. height. An external water-cooling system, using 200 to 300 gall. per hr. spread through ¼ in. nozzles on to the shell, supplied water cooling. Carbon blocks for a 6-ft. distance were used in the wall followed by 6 ft. of acid brick. An iron-block top-section completed the remainder of the lining. The cupola melting rate was increased from 9 tons per hour to 12; and the system required 5 per cent. more coke and 18 per cent. more air. The water cooling was applied when the furnace shell acquired a temperature of 315 deg. C. However the system proved unsatisfactory because a burn-out for 60-in. distance occurred and bridging was also frequently encountered.

In 1957 the water-cooling system was improved and four copper tuyeres installed, with 6-in. dia. openings. The tuyere area was reduced from approximately 20 per cent. in the original cupola to about 4 per cent. The tuyeres protruded 8 in. into the shell, and cost £165 each, the complete change-over costing £2,715. This water-cooled tuyere system permitted the blast input to be reduced to 10 per cent. and cut down the burn-out at least 50 per cent. The practice of operating the cupola without dropping its contents daily was followed and, except for sulphur contents as high as 0.25 per cent. on the first taps after an overnight shutdown, no additional difficulties were encountered.

Hot-blast System

Mr. Larson continued by describing a hot-blast system which had been installed six months previously, consisting of five large stainless-steel tubes vertically positioned, and capable of being heated to 540 deg. C. A counterflow system permitted the blast to be preheated to about 315 deg. C. The system was fitted with a control panel capable of adjusting the temperature for each of the preheated tubes. The revisions in the cupola structure, including insulation and dust work, cost a total of £18,500, but great economies resulted: a 40-in.

GIFS Meeting

instead of a 60-in., coke bed; a 23 per cent. reduction in coke consumed as the ratio of iron melted was raised from 6:5 to 9:5, and more steel scrap with less pig-iron was used for metal charges. The burn-out had been reduced to 18 in., representing a refractory input of 900 lb. per day as compared to 2,500 lb. previously. Operating costs in terms of man hours were reduced and the melting capacity of the cupola substantially increased. Maintenance costs were lowered and the preheating resulted in smaller losses in metallic ingredients such as silicon and manganese.

Ultimately these savings amounted to approximately 23 per cent. of the coke in the bed and 27 per cent. of the coke in the charge. Sixty per cent. of the patch material was saved and about 10 per cent. of the costs of the charge were saved. Total savings of the water-cooled furnace with preheated blast were expected to amount to £15,700 per year, for a capital expenditure of approximately £18,000. This improvement in economy was expected to rapidly amortize the cost of equipment.

Energy Consumption

Mr. Culling reviewed the history of electric-furnace melting in the grey-iron foundry, and compared the direct-arc, indirect-arc, high-frequency, medium-frequency and low-frequency electric furnaces in terms of their performance, costs and product quality. He reported that the 500 kwh. energy consumption commonly quoted for cast-iron melting actually worked out to about 800 kwh. in jobbing-shop practice. Melting costs varied with the price of electricity but in his experience these costs worked out to about £3 12s. to £4 per ton.

Aluminium in the Automotive Engine

By R. T. Thomson and D. F. Caris

The authors are, respectively: head of metallurgical engineering research staff, and engineer in charge of power development, of the General Motors Corporation.

Mr. Caris laid the ground work for this discussion by pointing out that the idea of an aluminium engine was not new. It was common for aircraft engines and desirable in passenger cars for improving efficiency. Engine developments since 1947 had profited from higher compression ratios, up to 12 to 1, which had improved economy and efficiency. Without these improvements to-day's engines would use 30 per cent. more fuel than in the 1930 designs.

Necessity for Economy

He said much pressure was being put upon the automotive engine designer to improve economy. Much economy has been lost through the increase in automobile weight brought about by the addition of accessories adding to comfort. The 1946 average weight of 3,800 lb. per car had risen to a weight of 4,400 lb. in 1958, with a 10 to 20 per cent. loss in mileage per gall. of fuel. The trend toward aluminium was based upon improvements to its wearing quality, and the possibility that it could be cheaper than cast iron if advantage was taken of its castability. By taking 200 lb. out of the weight of an engine, which could be done, additional weight would be acquired through the use of a lighter frame, lighter tyres, and other reductions in weight, which would ultimately reduce cost and add increased mileage per gall. to automobile economy.

Improvement in Aluminium

Mr. Thomson reported upon the metallurgical, production, and cost problems, saying that mechanical properties and corrosion resistance needed improvement. He compared the properties of aluminium and cast iron and showed how aluminium was improving. He pointed out that aluminium froze readily on to itself if subjected to a rubbing action, and said that if aluminium did not serve, it might be possible to use an aluminium block with cast-iron liners. However, the preparation and insertion of cast-iron liners and similar elements would make the cost exceedingly high. Improvement to the wearing quality of aluminium was required. This might be obtained by plating the metal with iron, nickel, or chromium, or spraying it with oxides of iron, molybdenum, or aluminium. These possibilities required the development of suitable aluminium alloys. A wear-resisting aluminium had been successfully developed, but it had a 50 per cent. greater machining cost, represented in part by excessive wear upon tools. These high manufacturing costs prohibited its use at present, but they could probably be reduced to where aluminium would compete successfully by achieving the expected saving in weight.

Mr. Thomson continued by saying that the auto industry employed about 50 lb. of aluminium per car in construction at present, and that increasing the aluminium content to 150 lb. per car would result in a saving of as much as 600 lb. of cast iron and steel. He listed the aluminium input per car as follows.

	lb. per car
Pistons	11
Transmission	22
Cylinder Block	50
Cylinder Head	40
Brake Drum	18
Clutch Housing	7
Intake Manifold	9
	157

This volume of metal, multiplied by three to compensate for the heavier weight of iron or steel, and used in 5¼ to 6 million cars annually, would represent a substantial change in metal weight and usage. Economy in the production of aluminium could be expected by using metal drawn directly from the reduction cells. Engine castings could be die-cast, or made in permanent moulds with, or without, sand cores, the use of sand moulds being considered uneconomical.

Hope for the Iron Industry

For the grey-iron industry, Mr. Thomson held out the hope that its members might (1) improve their product; (2) apply competitive methods, and (3) develop new products.

For example, he said, the production of cast buckets for gas turbines represented the application of precision casting to close tolerances requiring no machining and no forging, rolling or metal working prior to use. For the grey-iron foundryman, he suggested thoughts along the line of (1) the direct pouring of blast-furnace metal into castings; (2) improved methods for eliminating dirty and faulty castings; (3) the use of permanent moulds, employing dies capable of receiving metal at 1,650 deg. C.; (4) the product development of thin-walled die-castings; (5) the application of vacuum and pressure effects to die-castings, and (6) improved mechanical properties obtainable in thin-skinned castings. The experimental production of pressure-die-cast aluminium automobile-cylinder blocks had been described in the technical Press.

Closure of Pig-iron Plant

Because of a progressive fall in the demand for hematite pig-iron, one of the oldest pig-iron producing plants in Wales—the Briton Ferry Works, Limited, Neath (Glam)—is to close at the end of the year.

A spokesman for the Guest Keen Iron & Steel Company, Limited, the parent company, said that owing to the closure of certain acid-steel plants and the change to basic-steel production in others, demand in South Wales fell considerably in the early part of the year and this decline had persisted so that economic production was no longer possible.

The plant, which as well as being one of the oldest in South Wales is also one of the smallest, was closed in the 1930s and again from 1942 to 1948. It was then reopened to meet the very heavy demand for pig-iron which continued until the end of last year.

Of the 200 employed at the works about 80 are Italians. A small number of men will be required to stay on during the dispersal of the accumulated stocks of raw and finished materials. Notice of the closure has been sent to the Ministry of Labour and the trade unions concerned.

Diesel-generator Order for English Electric

An order worth about £660,000 for 10 diesel generating sets and ancillary equipment has been placed with the English Electric Company, Limited, by London County Council. Operating on gas from the waste products of sewage, the generators will be used at the County Council's Southern Outfall Works, a large new sewage-treatment plant, at Erith (Kent).

The sets have each a power output of 800 kw and are of the dual-fuel type which can operate on either diesel oil or gas. They will reduce the works' requirements of electricity from the London Electricity Board and help to offset the cost of sewage treatment. The complete range of equipment will be in use by 1962.

"Employer/Employee Co-operation"

What industry to-day most needed was co-operation between employer and employee, said Mr. J. Hugh Neill, Master Cutler and deputy chairman of Jas. Neill & Company (Sheffield), Limited, on October 25. He was speaking at the annual dinner of the Sheffield and District Foremen and Staff Mutual Benefit Society. "The employer should offer a square deal of a full day's pay in the best possible working conditions," he said, "and the employee should offer in return a square deal of a full day's work with no room for idleness or inefficiency."

There was a slight improvement in the trade position and if we could manage to hold our costs and maintain our prices, we should see the tide turn—but we must have that co-operation. "There is as much room for improvement in the offices as there is on the shop floor," he added.

The Cohen Committee had not welcomed the increase in unemployment, but it had certainly accepted it as the price to be paid if the general standard of living in this country was to be maintained; if economic stability of many other countries was not to be threatened, and if employment was to be available to the bulk of the working population.

JIC Banquet

Over 700 members and guests attended the annual banquet of the Joint Iron Council, held in the Dorchester Hotel, London, on Tuesday of this week. At the speaker's table were Mr. N. P. Newman J.P. (the president), Sir John Maud, G.C.B., C.B.E. (the Queen's Commissioner Designate for Basutoland, the Bechuanaland Protectorate and Swaziland; High Commissioner Designate in the Union of South Africa for Her Majesty's Government) who proposed the toast of "The Iron Industry"; His Excellency, E. N. van Kleffens; Sir Archibald Forbes; Mr. S. W. Martin; Sir Frederick Scopes (who proposed the toast of "The Guests"); General Sir Brian Robertson G.B.E., K.C.M.G., K.C.V.O., C.B. (who responded for the guests); Mr. Harmar Nicholls, M.P., and Mr. M. J. Glenny. The response to the toast of the "Iron Industry" was made by Mr. Newman. Formal proceedings concluded at about 10.30 p.m., after which, members and their guests circulated freely, renewing old friendships and making new acquaintances.

Esso's New Research Laboratories

Lord Hailsham, opening the new Esso Research Laboratories near Abingdon (Berks) last week, applauded the work which was being done by private industry in promoting research, but added that, as a nation, he did not think we knew enough, thought enough, or talked enough about research. "The resources devoted to civil research and development in this country have been, and are still, far too small."

Built and equipped at a cost of about £1,000,000, the new laboratories employ over 300 technologists and form the largest Esso research centre in the eastern hemisphere. The international scope of the company's work in this field was reviewed by Mr. C. S. Windebank, managing director of Esso Research, Limited, and the guests were welcomed by Mr. H. C. Tett, chief executive and managing director of the Esso Petroleum Company, Limited.

American Letter

Economics and Statistics

Political campaigns for representatives in the House and the Senate are in full swing with wide open promises of better things. In the economics of the USA a substantial improvement has occurred. It has in part been stimulated by deficit spending in which the government's share for the year is close to a 90-100 billion dollar rate. The low point in the business recession was reached about in April, and, using steel output as a barometer, the less than 50 per cent. rate which existed at that time has been lifted to exceed a 70 per cent. rate at the present time. This is the highest output for 1958 and the trend is upward. In the words of business and government forecasters, the upswing has recovered 75 per cent. of the business loss, bringing the rate up to 85 per cent. of the level that prevailed in 1956, the recent record year. Labour peace in the steel industry, and labour settlements in the important automobile industry, have aided in the recovery, along with extensive new construction projects which are in motion at the present time. Metal prices have become firmer and added confidence to prospects for the future.

The accompanying foundry statistics (Table 1), for the first six months of 1958 indicate a 25 to 35 per cent. decrease in activity, with the grey-iron foundry output somewhat less affected than its steel, malleable and non-ferrous companions. The usual summer-time decrease in activity was less severe in 1958, and it has been followed by a steady improvement which presages a further recovery in activity for the balance of the year.

TABLE 1.—*American Foundry Production Statistics.*

	Tons × 1,000		Tons × 1,000.	
	For the year		For six months	
	1956.	1957.	1957.	1958.
*Grey-iron castings ..	12,225	11,900	5,955	4,350
Coke consumption ..	2,521	2,214	1,189	889
S.-g. iron	—	89	—	44
Malleable iron	843	763	416	283
Steel castings	1,720	1,560	854	532
Iron and steel scrap consumed (tons × 1,000).				
Cupola (grey-iron) ..	8,680	8,150	4,310	3,310
Air-furnace malleable ..	1,012	916	493	344
Pig-iron (tons × 1,000).				
Cupola use	4,225	3,675	1,970	1,430
Air-furnace use	230	192	106	72
Electric furnace use ..	186	217	104	60
Non-ferrous castings (tons × 1,000).				
Aluminium alloy	355	336	182	129
Magnesium alloy	16	13	8	58
Copper-base alloy ..	422	390	203	163
Copper-ingot sales). ..	—	222	118.1	56
Zinc-base alloy	310	296	154.8	108

* Spheroidal-graphite iron castings included in these figures.

Conferences

A short survey of recent conferences held in America follows. Papers presented which were of particular interest to foundrymen are listed.

Mid-America Minerals conference of the American Institute of Mechanical Engineers, October 23-25: "Nickel and Cobalt Extraction at Fredericktown, Missouri," by R. M. McCormick, and "Continuous Casting of Magnesium," by John G. Scherer.

National Association of Corrosion Engineers conference, October 15-17: "Corrosion Problems in the Brewing Industry," by Rudolph A. Bender, Jr.; "Copper-base Material Corrosion Problems," by Irving S. Levinson; symposium on stress corrosion cracking in austenitic stainless-steels; symposium on developments in corrosion-resistant metals (chairman F. W. Fink); "Recent Developments in Light Metals," by P. D. Frost; "Uncommon Engineering Metals," by L. F. Kendall and John P. Denny; "New Developments in Heat-treatment improve Corrosion-resistant Alloys," by Walter A. Luce; "Developments in High-strength Corrosion-resistant Alloys," by F. H. Beck, and "Recent Developments in Oxidation Resistance and Protection of Refractory Metals," by C. T. Sims.

Metallurgical Society Meeting

The autumn meeting of the Metallurgical Society of the American Institute of Mining and Metallurgical Engineers was held in Cleveland on October 27. The following papers were of particular interest to foundrymen:—

(1) "Freezing of Liquid Metal in a Mould," by G. Horvay and J. G. Herzel;

(2) "Anneal-hardening in Aluminium-bronze," by R. W. Cahn and R. G. Davies, and

(3) "A Decision Technique for evaluating the Effect of Melting and Casting Environments on Stress-rupture Properties" (of a new nickel-base high-temperature casting alloy, intended for use as a turbine-blade material at 982 deg. C.), by J. T. Brown.

GIFS Annual Meeting

The 30th annual meeting of the Gray Iron Founders' Society, Incorporated, was held in Washington, D.C., at the Sheraton Park Hotel, from October 8-10. An account of two of the discussions held at the meeting is given on pages 575 to 577 of this issue of the JOURNAL.

Production Engineering Research

Leading authorities in the field of production-engineering research in many countries attended the general assembly of the International Institution for Production Engineering Research (CIRP), which was recently held in Britain for the first time. At the end of the assembly, Dr. D. F. Galloway, director of the Production Engineering Research Association of Great Britain, was elected vice-president of the Institution for the ensuing year, and he will officiate in this capacity at the ninth general assembly to be held in Switzerland in 1959.

The Institution was formed in 1949-50 when the four founder members decided to establish a common meeting ground on which scientists in the field of production technology could freely discuss problems. Production-engineering-research workers from 14 different countries now report their findings to the Institution, which thus plays an important role in the evolution of improved production techniques in many parts of the world. To ensure the highest standards of reporting and discussion, senior membership of the Institution is restricted to not more than four leading authorities in the field of production engineering research in each country. The Institution has for one of its main objectives the removal of barriers to effective communication between production-engineering-research workers in all parts of the world, and to this end is compiling an international dictionary of production engineering.

FTE & SA New President

At the annual general meeting of the Foundry Trades Equipment and Supplies Association, held in London last week, Mr. Gavin C. Paterson, of Paterson, Hughes Engineering Company, Limited, was elected president of the Association.

Company News

AUSTIN & PICKERSGILL, LIMITED, shipbuilders and repairers, etc., of Sunderland—Group profit, before tax, declined from £194,252 to £108,111 for the year ended June 30, 1958. The dividend remains at 15 per cent. After tax of £53,513 (£65,080) the net balance of £54,598 is £74,574 lower than the previous year.

BULLERS, LIMITED, engineers and ironfounders, etc., of Tipton (Staffs)—A final dividend of 10 per cent. makes an unchanged total of 15 per cent. for the year ended July 31, 1958. In addition the board has declared a special interim dividend of 5 per cent. in respect of 1959. Net profits were £102,929 (£107,981).

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—A final dividend of 20 per cent., making 30 per cent. for the year to June 30, 1958, is announced. This restores part of the cut in 1956-57 when the total was reduced from 40 per cent. to 25 per cent. Profits, before tax, which in the previous year contracted from £146,229 to £102,518, have risen to £177,145. The balance, after tax other than profits tax distribution charge, is £85,234, against £55,189 in the previous year and £82,569 in 1955-56.

STOTHERT & PITT, LIMITED, engineers and ironfounders, etc., of Bath (Som)—The directors state that, as indicated previously, although they hope to be able to maintain the present more liberal dividend policy, the proposed scrip issue must not be taken as implying any increase in the amount to be distributed as dividend. The directors propose to create 500,000 new ordinary shares, leaving 400,000 unissued capital after the capitalization. No further issue is at present in contemplation. Mr. A. V. Kennedy is not seeking re-election to the board.

JOHN I. THORNYCROFT & COMPANY, LIMITED, engineers, ship builders, and repairers, of London, S.W.1—Consolidated trading profits were halved at £413,207 (£826,760) in the year ended July 31, 1958. The final dividend is cut from 9 per cent. to 4 per cent., making 7½ (12½) per cent. for the year. In addition there is a 1 per cent. dividend from capital profits not subject to tax. The trading balance includes £236,000 (£105,000) profits on contracts completed or largely completed before August 1, 1957, but is struck after charging depreciation of £151,859 (£160,643).

SOLAR INDUSTRIES, LIMITED (formerly the Aluminium Castings Company, Limited)—The Canadian companies suffered a substantial loss and group net profits were reduced to £45,291 (£170,641). With the addition of losses of £79,596 (profits retained, £60,491) borne by subsidiaries, the parent company's net balance is £124,887 (£110,150). During the year the Canadian company, Renfrew Aircraft & Engineering, Limited, acquired the remaining capital of Norpoint. A company registered in Germany had not started trading at the close of the financial year, March 31, 1958. There is again no dividend on the ordinary shares.

ACROW (ENGINEERS), LIMITED—After studying the preliminary trading figures for the first six months of the present financial year, the chairman sees no reason why the dividend should not at least be maintained on the increased capital. Dividends for the year ended March 31 last, prior to the recently proposed one-for-six capitalization issue totalled 40 per cent. The company's UK properties have recently been valued for insurance purposes, and the freehold properties—excluding leaseholds—were assessed at £1,280,700, which compares with a balance-sheet figure of £385,547.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

799,511. Imperial Chemical Industries, Limited, Imperial Chemical House, Millbank, London, S.W.1.

A carbonaceous coating for foundry cores and moulds, which consists of a carbonaceous material, such as plumbago or blacking, suspended in a liquid medium containing isopropyl alcohol, and up to 16 per cent. by weight of water. It may also contain a resinous substance such as urea-formaldehyde or phenol-formaldehyde, the use of which ensures a smooth, hard coating after the usual burning off process. It is also less liable to rub off.

799,608. Regie Nationale des Usines Renault, 8-10 Av. Emile Zola, Billancourt (Seine), France.

This invention, dealing with the manufacture of moulds for casting, is based on the discovery of the very remarkable and suitable characteristics for foundry use of the alkali-metal silicates of certain composition. According to the invention, castings of regular shape, free from surface defects, and of constant dimensions to within a few hundredths of a mm. are reliably obtained. The moulds are easy to strip, and homogenous in their cohesion. These alkali-metal silicates contain between 200 and 270 gm. of silica SiO_2 per litre, approximately 17 per cent. to 24 per cent. by weight of the whole. The molecular ratio $\frac{SiO_2}{M_2O}$ (M being the alkali metal is comprised between 4.7 and 5.2). Perfect stability under storage for several months is also claimed. (See also B.P. 715,576.)

799,775/6/7. Wellworthy, Limited, Radial Works, Stamford Road, Lymington, Hants.

A novel foundry technique for bonding and casting aluminium or aluminium-alloy on to the surface of ferrous metals. This technique avoids the necessity of producing the interface bonding layer by a preliminary dipping in a bath of molten aluminium or aluminium-alloy, and then transferring the aluminized ferrous article to the mould or die where the cast is performed. According to the present invention both of these stages are carried out in the mould.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

HERTFORD, November 10—Works of water supply includes furnishing and laying of approximately 3,400 yd. of 6-in. spun-iron supply mains, with valves, hydrants, etc. Documents from D. Balfour & Sons, 131, Victoria Street, Westminster, London, S.W.1. Deposit £5.

WITNEY, OXON, November 17—Provision and laying of 370 lin. yd. 3-in. dia. cast-iron water mains at Southlawn Estate, Duckington Lane, for UDC. Documents from the Engineers and Surveyors, 26, Church Green, Witney.

FORMOSA, November 18—Agricultural machinery. (ESB/25838/58/ICA.)

BURMA, November 13—Semi-rotary pumps. (ESB/26542/58.)

SUDAN, November 24—Wood-planing machine. (ESB/26367/58.)

SOUTH AFRICA, November 21—Dust-extraction plant. (ESB/26249/58.)

SOUTH AFRICA, November 21—Wet-curtain-type spark arrestors. (ESB/26248/58.)

SOUTH AFRICA, November 21—Sandslinger. (ESB/26246/58.)

BURMA, November 15—Cast-iron pipes and fittings. (ESB/26739/58.)

SOUTH AFRICA, November 19—Axle-box castings. (ESB/26511/58.)

Personal

Mr. ANDREW B. LLOYD has resigned from the board of F. H. Lloyd & Company, Limited.

Mr. G. R. T. TAYLOR has retired from the board of International Combustion (Holdings), Limited.

Mr. G. C. R. ELEY has been appointed to the board of the British Oxygen Company, Limited.

Mr. J. N. TOOTHILL has been appointed a director of Ferranti, Limited. He is general manager of the company's Edinburgh factory.

Mr. C. H. ANGELL, chief accountant of the B.S.A. Tools group of companies, and Mr. P. B. HUGMAN, export manager, have been appointed directors of B.S.A. Tools, Limited.

Mr. J. H. CROSSEY, who earlier this year succeeded Mr. H. C. MACEWAN as manager of Harland & Wolffs' electrical division, has now been appointed to the seat on the board previously held by his predecessor.

Mr. F. T. C. LORD, director and secretary, has been appointed deputy managing director of Gjers Mills & Company, Limited. He will continue as secretary of the company. Mr. G. A. MARSHALL, commercial manager, has been appointed a director.

Sir DONALD BAILEY, KT., O.B.E., J.P., Director of the Ministry of Supply's Military Engineering Experimental Establishment at Christchurch, Hants (usually known as MEXE) has been co-opted to the Council of the British Welding Research Association.

Mr. DEREK DU PRE, joint secretary of the Institute of Cost and Works Accountants since September, 1956, has been appointed secretary of the Institute as from October 1. He succeeds Mr. STANLEY J. D. BERGER, who retired as director and secretary on September 30.

Mr. GEORGE M. MELLOR, Mr. FRED HOWARTH and Mr. ROBERT B. PAGE, chairman, joint managing director and technical director respectively of Bennis Combustion, Limited, have resigned their appointments with the company and its subsidiaries as from December 1.

Mr. VAN DEN TOORN, head of the department of commerce and management at the Sheffield College of Technology, has been appointed vice-principal of the Constantine Technical College, Middlesbrough, in succession to Mr. H. TAYLOR, who has been appointed to H.M. Inspectorate.

Mr. JOHN BLAKISTON, M.I.MECH.E., is to visit India very shortly, leaving on November 12 and probably returning by December 10. His business will be mainly of a routine nature in connection with the extension programme for the Indian Iron & Steel Company's foundries and machine-shops.

Mr. T. BOWYER JACKSON, Mr. ARTHUR L. SAYER, and Mr. B. G. DEWSBURY have been appointed local directors of Harrison (Birmingham), Limited, brassfounders, metal rollers, etc. Mr. Jackson will be in charge of general sales, Mr. Sayer of special sales, and Mr. Dewsbury of the London area.

Mr. J. W. HALL, under-manager of the Santon ironstone mine of the United Steel Companies, Limited, at Scunthorpe, has been appointed manager of a new ironstone mine at Easton, near Grantham, and has been succeeded at Scunthorpe by Mr. J. DARAGH, at present under-manager at Santon.

Mr. R. B. CRAIG, resident director at the Luton works of Laporte Chemicals, Limited, and Laporte Titanium, Limited, retired from his executive appointment on October 30, after 36 years' service. Mr. Craig is also resigning his directorships of these two subsidiaries, but will remain a director of Laporte Industries, Limited.

Mr. L. C. W. TURNER has resigned his directorships with Brush Electrical Engineering Company, Limited, and Brush Export (India), Limited, members of the Hawker Siddeley group, with effect from December 31, in order to take up an appointment as director and general manager of Aircraft Marine Products (Great Britain).

B. O. Morris, Limited, Coventry, announce that Mr. J. T. TROMAN has been appointed a director of the machine-tool division of the company at Portsmouth; Mr. O. G. EVES has been appointed works director at Coventry, and Mr. L. SMITH becomes a director of a subsidiary company, Bramble Engineering Company, Limited, Coventry.

Mr. B. HOMFRAY-DAVIES, who for 25 years was managing director of Metropolitan Cammell Weymann, Limited, has been appointed managing director of Arusha Industries, Limited. He was appointed managing director of Aero Maintenance Equipment, Limited, one of the Arusha group of companies, in February last, still retains that appointment.

Mr. J. HARWOOD FRYER, has resigned from the board of Crompton Parkinson, Limited. He joined the group in 1926 and, after having been secretary since 1930, was appointed an executive director of the company in 1939. He was appointed managing director of Crompton Parkinson in 1946, a position which he held until his retirement from executive duties in 1957.

Sir ASHLEY WARD, president of Thos. W. Ward, Limited, and chairman of the Parkgate Iron and Steel Company, Limited, presented the awards at the annual presentation of prizes to apprentices, and awards to long-serving employees, of Robert Jenkins and Company, Limited, engineers, Rotherham, on October 27. There were 14 for long service and 18 to trainees and apprentices.

Owing to health reasons, Mr. W. A. CRAIG is to retire from C.A.V., Limited, Mr. B. F. W. SCOTT will succeed him as vice-chairman. Mr. Scott will relinquish his appointment as sales director of Joseph Lucas (Electrical), Limited, but will remain as a special duty director. These arrangements will become effective as from January 1, but Mr. Craig will continue as a director of C.A.V. until March 31.

Mr. C. S. JOHNSON, who for seven years was chief metallurgist at West Yorkshire Foundries, Limited, and later chief inspector at the Leyland and Chorley works of Leyland Motors, Limited, for four-and-a-half years, has been appointed foundry manager at the Farington foundry of Leyland Motors, Limited. Mr. JOHN CARTMELL, who has been the foundry superintendent for several years, has now been appointed production manager (foundry).

Stone-Platt Industries, Limited, announce that Mr. K. H. PRESTON has resigned from the boards of Prince-Smith & Stells, Limited, and Tweedales & Smalley, Limited. LORD JESSEL has resigned from the board of Tweedales & Smalley. Mr. R. CHILES, managing director of Prince-Smith & Stells has been appointed executive chairman of that company and Mr. O. G. L. Holmes, a director of Prince-Smith & Stells, becomes managing director.

To celebrate Mr. JOHN TENNANT'S completion of 60 years in their service, Federated Foundries, Limited, gave a luncheon in his honour in Glasgow recently. Now in his 78th year, Mr. Turner started his working life in 1897 as an apprentice blacksmith in Kirkintilloch, but a year later he joined the clerical staff of Cameron & Robertson, Limited (a subsidiary of Federated Foundries, Limited) and in 1919 became the firm's representative for Scotland.

Obituary

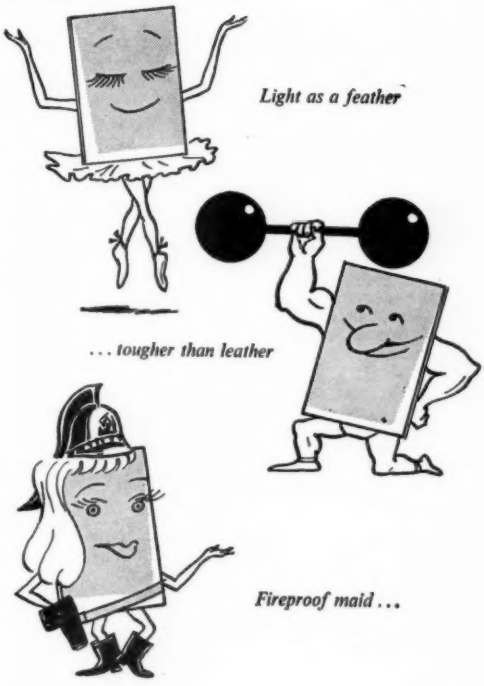
Mr. HENRY KIRSOP EGLIN, ironfounder and agricultural engineer, Beverley Road, Market Weighton, Yorkshire, died on October 26 at the age of 73.

The sudden death took place at the end of last month of Mr. FRANK J. CREE, who was in reality the oldest member of the Institute of British Foundrymen which he joined on its formation. The son of a moulder, Mr. Cree was apprenticed to the same trade, but being enterprising, ran away before he finished his time and after a few months working as a journeyman was returned by the police to finish his indentures. As a youth, he was a great footballer and played for Notts Forest and Aston Villa. By 1902, he was foundry manager at R. A. Lister & Company, Limited. Later, he was manager of Aveling & Porter, Limited, at Peterborough, later with Wingets, Limited, of Rochester. When most people would be retiring, he interested himself in the introduction of the Randupson cement/sand process into this country, owned a small brass foundry and to the very end of his long life—he was well over 80—operated a small agency business and was a county player of bowls. His cheeriness and profound knowledge of foundry conditions of 60 and 70 years ago made him a particularly interesting companion at technical gatherings in which he took such a personal and active part.

Recent Wills

BROOKE, J. W. M., one of the founders of Brooke Marine, Limited, shipbuilders and engineers, of Lowestoft	£3,803
WARD, C. J., of Erdington, Birmingham, scrap metal merchant, managing director of C. T. Ward & Sons, Limited	£24,548
ATTENBOROUGH, ARCHIBALD, retired traffic clerk, formerly employed for 50 years by the Staveley Iron & Chemical Company, Limited	£6,524
ONIONS, C. H., a director and son of the founder of Onions & Sons (Levellers), Limited, manufacturers of earth-moving equipment, etc., of Bilston (Staffs)	£65,200
MORRIS, J. M., who had served as London and later Glasgow, manager of Wickman, Limited, machine-tool manufacturers, of Coventry, and afterwards became sales director of Coventry Climax Engines, Limited, first president of the British Industrial Truck Association	£18,987
MCARTHUR, HAMISH, chief development officer of the Iron and Steel Board	£10,603
YAPP, SIR FREDERICK CHARLES, formerly chairman of Vickers-Armstrongs, Limited	£27,567
BARTON, WILLIAM, works manager for 45 years of the Revo Electric Company, Limited, Tipton (Staffs)	£4,023
MITCHELL, W. W., managing director of the Grahamston Iron Company, Limited, Falkirk (Stirlingshire)	£116,184
WINTER, D. B., joint managing director of Spermolin, Limited, foundry supply manufacturers, of Halifax (Yorks)	£40,439
ELLISON, HENRY, founder chairman of Yorkshire Tar Distillers, Limited, and formerly chairman of the Sheffield Chemical Company, Limited, and James Wilkinson & Son, Limited	£543,378

Mr. W. B. LAWRIE, M.B.E., M.SC., has been awarded the "Filtration Prize" of the Institution of Mechanical Engineers for the paper he presented to a conference in London organized by the Institution on "The Mechanical Engineer's Contribution to Clean Air." This is particularly gratifying, as Mr. Lawrie (who is one of HM Engineering Inspectors of Factories) in his paper "Foundry Atmospheres" showed what great strides had been made by the foundry industry in recent years in connection with Clean Air requirements. The award indicates how very adequately he put founders' efforts "into the picture" as far as mechanical engineers are concerned.



Core Tray Chorus

O HOOKERLITE is my delight,
The Core Tray of the century!
And if you ask me why, good sir,
Here is my inventory:—

Light as a feather, tougher than leather,
Phenomenal trays, these core trays,
Fire-proof made, the finest grade,
Of never seen before trays.

Economical, astronomical,
Tres bon trays, these core trays.
Smooth to lie on, hard as iron,
Last for ever more trays.

And now to the men in the foundry stores,
As the rooks would say, for the good of the cores,
Beware of trays that are nearly right,
Insist on trays of HOOKERLITE.

W. J. HOOKER LTD

239a, Finchley Road, London, NW3
Telephone: Swiss Cottage 3281-2-3

News in Brief

METAL PORCELAINS, LIMITED, Cornwall Road, Smethwick, announce the following appointments to the board of directors: Mr. J. SEMPLE becomes managing director, Mr. G. A. GREENWELL technical director, and Mr. L. A. READ works director.

SHEFFIELD COLLEGE OF COMMERCE AND TECHNOLOGY started on Monday, November 3, a six-week reorientation course for ex-regular officers under the East and West Ridings Regional Resettlement Committee. Similar courses will be run for the rest of the academic year.

THE SHEFFIELD MUSEUM SOCIETY held its first meeting of the 1958/59 session at the Weston Park Museum on October 28, when Mr. W. E. Bennett, lecturer in silversmithing at Sheffield College of Art, gave a talk and demonstration on "Some Problems and Accomplishments in Ornamental Silver."

HATTERSLEY BROTHERS, LIMITED, Queen's Foundry, Swinton, Mexborough, Yorks, will be amongst the exhibitors at the Public Works and Municipal Services Exhibition, to be held at Olympia from November 10 to 15. The company's exhibits will include solid-fuel appliances and gas-fired boilers.

HEPBURN CONVEYOR COMPANY, LIMITED, Rosa Works, Wakefield, Yorks, which recently embarked on a £50,000 scheme for new premises and machinery, including a factory for the manufacture of blast-cleaning material, has received an order worth £12,000 from an iron foundry in Australia.

TO CELEBRATE its 50 years of service to chemical engineering, the Kestner Evaporator and Engineering Company, Limited, entertained just over 100 guests at a dinner in the Savoy Hotel, London, W.C.2, on Tuesday, October 21. Mr. J. Arthur Reavell, founder and chairman of the company, presided.

IT IS REPORTED that orders for Rolls-Royce Conway engines now total £13,000,000, and the first consignment, destined for the Boeing Airplane Company's plant in Seattle, left London for America on October 26. These will power 707-420 planes for eventual use on BOAC, Lufthansa, Air India and Varig, of Brazil, lines.

"A TEMPORARY RECESSION IN ORDERS FOR PIG-IRON" was the reason given in the announcement on October 31 that 40 furnacemen employed by the Sheepbridge Company, Chesterfield, will be on short time until Christmas. The men will have lost the equivalent of one and a half weeks' work by Christmas.

PLATT METALS, LIMITED, manufacturers of non-ferrous ingots and printing metals, were among those awarded a gold medal at the Brussels World Exhibition, 1958. As part of the Engineering Centre collective exhibit, Platt Metals received their award for design, presentation and appearance of their stand.

ABOUT 400 MEN are likely to become redundant at the Elswick Works, Newcastle-upon-Tyne, of Vickers-Armstrongs (Engineers), Limited, during the next few months, as a result of a decision to move the section making variable speed gears to Weymouth. Most of the redundant men are likely to be members of the AEU.

GRIFFIN & GEORGE, LIMITED, laboratory furnishers and manufacturers of scientific apparatus, are now connected to the Telex system at their Alperton Warehouse (Telex 21126) and Birmingham warehouse and works (Telex 33-033). Their other provincial branches will be connected as soon as the installations are complete.

AS PART OF THE EXPANSION PROGRAMME for the Rogerstone Works, Northern Aluminium Company, Limited, have ordered from Associated Electrical Industries, Limited, heavy-plant division, Rugby, a number of large electric drives for rolling mills. These include two 4,000 h.p. d.c. motors forming a "twin-drive" for the main mill unit in the programme.

PYROMETRIC EQUIPMENT COMPANY, LIMITED, Market Harborough, Leicestershire, have recently issued a catalogue dealing with various electric furnaces for general laboratory and heat-treatment work. Thermocouples, pyrometric accessories and a range of laboratory and small industrial electric furnaces, varying from conventional muffle-types to special designs, are also dealt with.

THE EAST MIDLANDS GAS BOARD has decided to abolish all deposits on hire-purchase sales of gas appliances, it was announced on October 31. Also, in many cases, repayments will now be possible over a period of five years, as against the previous two years' limit. Previously a deposit of one-third of the total value had been necessary on all appliances, with the exception of cookers on which deposits were eased earlier this year.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, of Elecfurn Works, Watford, Herts, announce that they have received an order for a special 50-lb. induction vacuum furnace from Bristol Aero-Engines, Limited. The furnace will be equipped with a high-speed pumping system, and three different sizes of crucible and coil will be supplied. A 22-in. diameter external mould chamber will be incorporated for the introduction of hot moulds.

AT A MEETING IN DÜSSELDORF on October 18, a European Federation of Purchasing (*Fédération Européenne de l'Approvisionnement*) was formed, the founder members of which are:—*Bundesarbeitsgemeinschaft Industrieller Einkauf* (Germany); *Compagnie des Chefs d'Approvisionnement* (France); *Nederlandse Vereniging Voor Inkoop-Efficiency* (Holland); Purchasing Officers Association (United Kingdon), and *Svenska Inköpsledares* Foregning (Sweden).

TWIFLEX COUPLINGS, LIMITED, The Green, Twickenham, Middlesex, a member of the Sheepbridge Engineering group, announce the conclusion of an agreement with Zahnaderfabrik Renk AB, Gogginger Strasse, 7- - 81, Augsburg (13b), Germany (the well known gearbox manufacturers), whereby the Renk company will have sole manufacturing rights for the complete range of the British company's automatic-clutch and flexible couplings for Germany.

THOS. W. WARD, LIMITED, Sheffield, have acquired the entire share capital of E. H. Pickford & Company, Limited, of Ecclesall Road, Sheffield, and of Derby, automobile engineers and main dealers for the Rootes group. The company will continue under the existing management with the addition of Mr. H. W. Secker, chairman and managing director of Thos. W. Ward, Limited, and Mr. R. Askham, director of the Deighton Motor Company, Limited, who have been appointed to the board.

THE INSTITUTION OF PRODUCTION ENGINEERS announce that so much interest has been aroused by the issue of the draft bibliography on "The Effect of Technological Progress on Education" that stocks have been exhausted within two weeks of its first being announced. As a result, the Institution has decided that the work shall be expanded and made available in permanent printed form, within the next two months. The price of this new edition will be 14s. 6d. plus 1s. postage and packing.

WOLF ELECTRIC TOOLS, LIMITED, announce that in the light of the company's substantial development since

(*Continued on page* 584)

Electrical Aids in Industry *Data Sheet* **No. 3**

Induction Heating – 2

The broad principles involved in the use of induction heating for melting and processing metals have already been dealt with in this series (Data Sheet No. 2). In order to make a critical examination of its possibilities, however, the potential user should be aware of certain technical factors which must influence his decisions.

Induction heating, of course, demands the use of alternating current which is available from the public supply at a frequency of 50 cycles per second. Higher frequencies, however, are desirable for certain applications and can be obtained by means of the appropriate conversion equipment. Frequencies can therefore be considered in three categories:

Mains Frequency
(direct from mains)—50 c.p.s.
Medium Frequency
(machine generator)—50–10,000 c.p.s.
High Frequency
(electronic generator)—up to about 2,000,000 c.p.s.

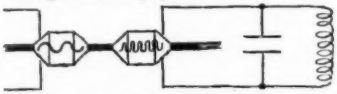
Mains Frequency

This needs no conversion equipment; it is particularly suitable for melting large pieces of scrap, and owing to the vigorous stirring forces produced, is excellent for alloy making. It has the merit of low initial cost compared with the high frequency method of melting, but is not so suitable for the production of high-grade steel.

A typical example of the use of mains frequency is the coreless induction melting furnace which can be connected direct to the public 3-phase supply. Such a furnace rated at 120 kW, with a holding capacity of 2,240 lb., will give a throughput of 5,000 lb. per hour of hot cupola metal superheated from 1,350°C to 1,450°C.

Medium Frequency

Motor generators ranging from 10 kW to 1,500 kW or more at frequencies up to about 10,000 c.p.s. are widely used for heating for forging, melting from 100 lb. to 10 tons, hardening, annealing, etc. A bank of capacitors maintains a high power factor during the heating cycle.



Another form of generator for frequencies of 1 to 2 kc.p.s. and powers around 250 kW, useful for forge heating and melting high temperature aircraft alloys, is a 6-anode steel tank mercury arc inverter.

High Frequency

Metal hardening and metallurgical processing are best handled by high frequency induction (up to about 2,000,000 c.p.s.), particularly when a very thin case is required or when the section of the workpiece is too small to heat satisfactorily at medium frequency. These high frequencies are produced either by an electronic h.f. generator or a mercury-gap h.f. generator.

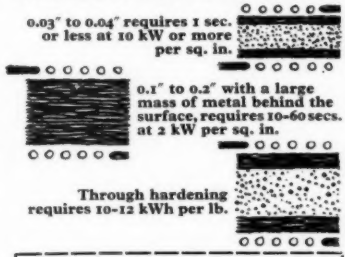
The choice of frequency depends upon the metallurgical requirements and the size of the component to be treated. The following table gives the practical relationship between size and frequency, and may be used as a guide to the choice of generator, subject to metallurgical considerations.

FREQUENCY C.P.S.	3,000	10,000	500,000	2,000,000
Optimum Values				
MIN. DEPTH OF HARDNESS POSSIBLE	.060"	.040"	.020"	.010"
Practical Values				
MIN. DEPTH HARDNESS EXPECTED	.150–.200"	.100–.150"	.030–.050"	.015–.030"
MIN. DIA. SURFACE HARDENING THIN CASE	2" & over	1" to 3"	½" to 2"	¾" to ½"
MIN. DIA. SURFACE HARDENING DEEP CASE	2" & over	2" & over	1" & over	not suitable
MIN. DIA. THROUGH HARDENING	1" & over	½" to 2"	¼" to ¾"	not suitable

These are of course very approximate since they also depend on metallurgical considerations.

Power required for H.F. Induction Hardening

The high frequency power required per sq. in. of hardened surface depends upon the amount of metal behind the surface. Higher powers and shorter heating cycles are necessary for thin cases and when the thickness of metal behind the surface is small.


0.03" to 0.04" requires 1 sec. or less at 10 kW or more per sq. in.
0.1" to 0.2" with a large mass of metal behind the surface, requires 10-60 secs. at 2 kW per sq. in.
Through hardening requires 10-12 kWh per lb.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association. Excellent reference books (8/6, or 9/- post free) are available on electricity and productivity – "Induction & Dielectric Heating" is an example.

E.D.A. also have available on free loan a series of films on the industrial use of electricity. Ask for a catalogue.

Issued by the
Electrical Development Association
2 Savoy Hill, London, W.C.2

6515/4

News in Brief

(*Continued from page* 582)

any appointment was made to the original board of directors, it was decided (upon the recent retirement of Mr. R. F. Hatto, sales director) that the board be increased in number and the following members of the staff have been elected, from October 1: Mr. N. McCann, to be secretary and director; Mr. R. G. J. Nisbet, director of Canadian operations; Mr. J. A. Jackson, works director, and Mr. W. N. Scottorn, sales director.

ELECTRONIC AND X-RAY EQUIPMENT to the value of £40,000, were on show at an exhibition opened at Harrogate on October 27, in connection with the opening of Marconi's new showrooms and northern-area offices in Stanton Square. Much of the equipment was concerned with securing safety and perfection in nuclear-power plant and other spheres of engineering. One unit which was shown could provide a single radiograph of the entire circumference of a pipe in four minutes, compared with four hours needed for separate sectional photographs

AT THE INAUGURAL DINNER, on October 22, of the Wolverhampton group of the Incorporated Sales Managers' Association, now come to full status as the South Staffordshire branch, Sir Geoffrey Mander was installed as the branch's first president by Mr. Arnold Lucas, the national chairman. Sir Geoffrey in his presidential address stressed the need to "tell the world" about the products of UK industry. Mr. J. Blanchard, chairman of the Birmingham branch, installed Mr. J. P. Montgomery as chairman of the new branch.

DEVELOPMENT WORK in progress at the Tube Investments Technological Centre at Walsall and its new beryllium laboratory, has resulted in the production of what is believed to be the longest, small-bore beryllium tube yet produced (the bore is 0.300 in.; the wall thickness 0.040 in., and the tube is between 2 to 3-ft. long). Also made was a very-thin-walled beryllium tube, with a diameter of 0.7 in. and wall thickness of 0.012 in. in lengths of two to three ft., in addition to beryllium tubes of 8 to 10-ft. long, of wall thickness 0.080 in. upwards, and diameters of ½ in. upwards.

THE SECOND ANNUAL MEETING OF SCIENTIFIC SOCIETIES in South Wales and Monmouthshire will be addressed this year by Sir Hugh Beaver, K.B.E., L.L.D., whose subject will be "A Ministry of Science." Sir Hugh Beaver is managing director of Arthur Guiness, Son and Company, Limited, a director of Richard Thomas and Baldwins, Limited, and president of the Federation of British Industries. The Lord Mayor of Cardiff, Alderman A. J. Williams, J.P., will open the meeting, which is being held in the Reardon-Smith Lecture Theatre, National Museum of Wales, on November 21, commencing at 7.30 p.m.

STANLEY FIREBRICK WORKS, at Llanelly, has been taken over by G. D. Thomas (Refractories), Limited, the Llanelly firm which makes a special type of brick for the steel industry. The Stanley works, which had been in production for well over 50 years, became idle last year following the death of its owner, Mr. T. J. Davies. Mr. Arthur Guest Thomas, a principal of G. D. Thomas, Limited, said that the development would certainly provide more employment locally in the brick-making industry and it was hoped to get the Stanley works into full production by January.

BUSINESS DECLARED by Export Credits Guarantee Department "commercial" policyholders in the third quarter of 1958 amounted to £141,300,000, a figure exceeded only by the record declarations of £143,500,000 in the first quarter of 1957. The third quarter is normally a slack period for declarations, and this year's figure exceeded by 26 per cent. that for the corresponding quarter last year. The face value of current short-term policies increased during the quarter by £22,200,000 to £586,800,000, and the number of short-term policies from 4,304 to 4,408. New medium-term business transacted during the quarter amounted to £26,900,000, bringing the quarterly average for the current year to date to £23,600,000.

AT A MEETING of section IX of the *Fédération Européenne de la Manutention* (Mechanical Handling Federation) held in Ostend last month, a special committee consisting of representatives from France, Germany, and Great Britain was appointed to discuss further the factor of safety of hand-hoists and, in particular, the German delegations' desire to work to a lower factor of safety than the majority of the other countries involved. In order to preserve continuity it was decided that the present office bearers should be re-elected, and these are as follows:—chairman: Mr. H. Huber (Switzerland); vice-chairmen: Mr. F. Stein (Germany), Mr. M. Verlinde (France), and Mr. L. J. Tichelly (Great Britain).

BRITISH WELDING RESEARCH ASSOCIATION have published a booklet entitled "Classified Radiographs for defects in Aluminium-fusion Welds" (H3/58), which shows how to identify those defects in aluminium fusion-welds which can be seen in radiographs. The defects are classified, their origin explained and suggestions for their prevention are made. The booklet, prepared by the senior metallurgists of BWRA, assisted by a panel of experts from industry, has 53 illustrations, and is well indexed. The radiographs in the book were chosen out of several hundred provided by the co-operating companies.

THE TECHNICAL DISCUSSION GROUP of the Lancashire and Yorkshire region of the British Steel Founders' Association visited the foundry departments of Edgar Allen & Company, Limited, Sheffield, on October 30. The firm has spent nearly £250,000 on modernization and re-equipping the heat-treatment shop, and details of the conversion were given by Mr. J. W. Robinson, fettling and finishing manager of the foundry division. One particularly interesting feature was a circular furnace of 12-ft. 6-in. dia., supplied by G. P. Wincott, Limited, furnace builders, Sheffield, designed to deal with castings of exceptional size or difficult shape. The main part of the furnace is underground, but three sections, including a cone-shaped top, are above ground, and these sections can be lifted off by crane. When all is in position there is a depth of 10 ft. 3 in. and when two removable sections are stowed away, there is 5 ft. 3 in. It was decided to use city gas for fuel and a new main was laid from the gasworks for the new demand. The estimated additional load is about 200 million cub. ft. a year—about double the previous annual consumption of the works.

Complimentary Dinner to Dr. Pearce

It is reported that there are still a few places available at the complimentary dinner to be offered to Dr. J. G. Pearce on the occasion of his retirement from the position of director of the British Cast Iron Research Association. This function is to take place at the Connaught Rooms, London, on Monday, December 15. Applications for tickets, which cost 55s. each, should be made to Mr. T. E. Whiteside, A.C.A., secretary, BCIRA, at Alvechurch, Birmingham.

APPROVED FOR A GOOD

FOUNDRY FLOOR

Molten material ran over this floor, part of which was of ordinary concrete, whilst the portion nearest the furnace was of Refractory Concrete. The ordinary concrete disintegrated completely, but the Refractory Concrete was unaffected. (A corner is broken off the latter for the purpose of identification.)

REFRACTORY CONCRETE

Made with CRUSHED FIREBRICK AND CIMENT FONDU READY FOR USE IN 24 HOURS

CIMENT FONDU
Read Trade Mark
ALUMINOUS CEMENT

The Cement for Industry

SEND FOR BOOKLET "FOUNDRY FLOORS IN REFACTORY CONCRETE"

LAFARGE ALUMINOUS CEMENT CO. LTD. 73 BROOK STREET, LONDON, W.1. TEL: MAYfair 8546

AP76

Imports and Exports of Iron and Steel in September

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in September. Totals for the first nine months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended Sept. 30.	Nine months ended September 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Channel Islands	392	2,599	3,464
Cyprus	258	9,179	4,885
Sierra Leone	1,202	10,742	10,172
Ghana	2,514	17,760	12,175
Nigeria	5,162	41,867	49,578
Union of South Africa	6,795	84,121	75,909
Rhodesia and Nyasaland	1,831	51,702	27,907
Tanganyika	1,432	17,895	9,918
Kenya	2,146	38,562	31,413
Uganda	214	2,873	2,484
Mauritius	91	2,492	2,596
Aden	215	3,161	2,366
Bahrein, Qatar, and Trucial States	830	11,441	6,896
Kuwait	2,951	27,587	33,581
India	11,430	186,049	102,171
Pakistan	2,509	51,615	45,785
Singapore	2,044	28,864	25,711
Malaya	838	25,372	11,442
Ceylon	440	20,592	20,383
British North Borneo	164	3,070	1,707
Hongkong	5,111	63,694	43,270
Australia	9,644	145,450	75,315
New Zealand	12,988	153,010	140,258
Canada	9,897	215,103	133,783
Jamaica	2,582	17,258	16,433
Trinidad	3,288	36,174	38,205
British Guiana	395	5,736	5,660
Other Commonwealth countries	4,068	21,542	29,802
Eire	3,838	31,641	37,824
Finland	3,993	64,382	38,582
Sweden	7,466	80,941	92,407
Norway	6,057	80,860	67,083
Denmark	6,471	81,049	66,375
Western Germany	6,536	7,065	35,962
Netherlands	6,659	76,618	61,253
Belgium	7,715	35,037	23,040
France	737	13,352	3,540
Switzerland	302	13,007	7,435
Portugal	1,433	14,160	10,993
Spain	1,568	30,694	36,069
Italy	5,387	39,584	40,955
Austria	889	3,996	8,144
Yugoslavia	400	8,522	3,401
Greece	1,095	8,661	10,666
Turkey	205	5,293	3,732
Netherlands Antilles	158	2,569	1,470
Portuguese East Africa	214	3,616	1,898
Egypt	56	3,742	11,729
Sudan	1,383	14,829	28,700
Lebanon	3	10,080	8,566
Israel	546	3,263	5,970
Saudi Arabia	151	3,152	3,649
Iraq	2,941	31,607	27,487
Iran	6,025	47,461	29,836
Burma	1,334	20,643	7,977
Thailand	162	6,160	5,186
Indonesia	75	5,616	1,653
Philippine Republic	593	4,553	2,920
USA	7,788	38,601	59,987
Cuba	493	6,390	4,318
Colombia	55	5,124	4,953
Venezuela	3,565	88,667	56,643
Ecuador	60	2,016	2,092
Peru	1,035	9,491	8,700
Uruguay	91	5,637	813
Argentina	12,688	65,637	108,211
Other foreign countries	16,854	105,657	110,954
TOTAL	208,452	2,374,883	2,004,442

Total Imports of Iron and Steel

From	Month ended Sept. 30.	Nine months ended September 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	609	3,834	5,116
Canada	1,744	34,142	16,513
Other Commonwealth countries and Eire	1,800	18,163	18,647
Soviet Union	512	202,947	108,238
Sweden	4,578	24,616	27,799
Norway	5,680	86,727	56,617
Poland	—	7,383	173
Western Germany	9,612	77,308	63,933
Netherlands	8,854	46,377	106,993
Belgium	4,738	117,934	85,311
Luxembourg	619	19,847	5,672
France	1,165	48,571	16,201
Italy	683	3,327	5,352
Austria	114	58,717	3,743
Japan	233	10,747	2,777
USA	653	210,127	114,328
Other foreign countries	464	18,013	4,062
TOTAL	42,058	988,780	641,475
Iron and steel scrap and waste, fit only for the recovery of metal	2,670	568,345	61,047

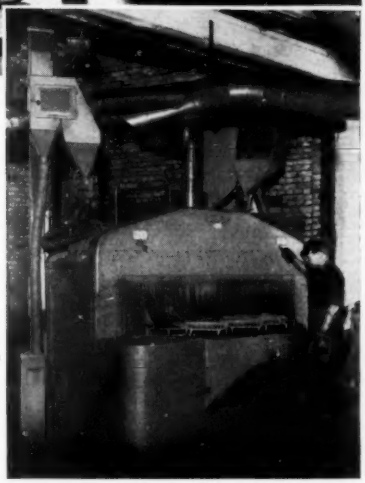
Exports of Iron and Steel by Products

Product.	Month ended Sept. 30.	Nine months ended September 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Pig-iron	17,928	96,809	103,557
Ferro-columbium (niobium)	3	77	29
Ferro-tungsten	132	408	541
Other ferro-alloys	335	2,491	2,589
Ingots blooms, billets, slabs, sheets, and tinplate bars	4,210	893	12,521
Iron bars, rods, angles, shapes, and sections	72	1,419	1,167
Steel bars, rods, angles, sections, and shapes	18,384	394,672	246,037
Iron plates and sheets	1	402	1,248
Universal plates	163	5,149	3,369
Steel plates, ⅛ in. and under ¼ in.	907	8,969	6,341
Ditto, ¼ in. and over	10,810	140,152	132,756
Blacksheets and blackplate	19,871	252,847	210,430
Hoop and strip	7,407	68,163	51,433
Tinplate	37,928	302,316	281,761
Decorated tinplate	219	3,910	2,553
Galvanized sheets	8,165	151,574	59,521
Other (incl. tinned sheets, terne-plate, and ternesheets)	1,271	14,188	10,201
Railway and tramway construction material	14,106	197,610	189,822
Wire rods of steel (incl. alloy steel)*	3,977	43,498	27,224
Wire	8,075	81,167	76,333
Tubes, pipes, and fittings	53,650	598,364	568,161
Iron castings	236	1,494	9,059
Steel castings	74	2,073	1,995
Forgings	528	6,238	5,794
TOTAL	208,452	2,374,883	2,004,442

* The figures for 1958 are not completely comparable with those for previous years.

FOLLOWING A VISIT of Mr. G. Godwin, managing director of Martonair, Limited, to Italy, the firm of Vagnone & Boeri, of Corso re Umberto 18, Turin, has been appointed agent for Martonair pneumatic equipment in that country. Vagnone & Boeri also has offices in Milan and Rome.

PRAT-DANIEL (STANMORE), LIMITED, Whitecroft, Nailsworth, Gloucestershire, announce that the name of the company has been changed to Prat-Daniels (Stroud), Limited.



Baker Perkins Foundry Machinery at work in Wilmer Lea Foundries Limited

Illustrated is a Baker Perkins Rotary Table Shot Blast Machine working in Wilmer Lea Foundries Limited, London's largest Iron Founding Company. This modern and efficient machine includes our patented bi-phase impeller system with low power consumption. Special foundations are unnecessary. Why not write to us for full details of our Shot Blasting range?

BAKER PERKINS LTD
Foundry Machinery Division
PEDEWELL WORKS · HEBBURN ON TYNE · ENGLAND

B.P.110

Raw Material Markets

Iron and Steel

There is no appreciable change in business at the ironfoundries, all of which could undertake more work than is at present available. This applies to all grades and types of castings. High-duty and heavy castings continue in biggest demand and the engineering and speciality foundries are able to maintain outputs at more satisfactory levels than those being obtained by other branches of the industry.

From the motor-car trade come regular schedules for deliveries of castings and, while these are not at present so heavy as they have been in the past, they are still on a fairly good scale and sufficient with the demands from many other trades for castings from these foundries to ensure production at reasonably good levels. The machine-tool and also the heavy-engineering trades continue to show a decrease on previous demands for castings.

The light foundries on the whole are only moderately employed, the expected improvement at these foundries having not yet materialized. Some units are better employed than they were, but much more business is required to ensure an overall improvement. More work is needed by most of the jobbing foundries, and many of the textile foundries are very quiet.

The foundries are well provided with raw materials; pig-iron in all grades is plentiful, and producers would welcome a much larger demand to enable them to clear a greater proportion of their makes direct to the foundries instead of having to increase stocks. Low-phosphorus irons are in steady demand and there is a fairly good call for hematite, but demand for high-phosphorus irons remains moderate. In recent months, although outputs of most grades of pig-iron are now on a reduced scale, stocks have risen sharply and orders being placed with the furnaces are insufficient to absorb overall outputs.

Only moderate demands continue to be received by the re-rollers for their products, and working hours cannot yet be increased to normal levels. The majority are on a four-day week and even at this reduced rate of working difficulty is experienced in securing orders to make up rollings.

Home steelworks can deal comfortably with the present demands for steel semis and, in fact, could undertake a much larger tonnage.

Non-ferrous Metals

Zince is featured this week, as its price in London has been higher than that for lead for the first time since the beginning of 1953. Neither zinc nor lead have been active markets over the last two years. In fact, the decline of the US automobile industry took most of the fight out of lead and this factor plus the sharp drop in US steel production brought about the near collapse of the zinc price. However, the last few months has seen an improvement in the American economy in general and in the steel and automobile industries in particular with beneficial results to both metals. At present, demand in the US for both "Prime Western" and special high grades of zinc is good and steady. Stocks are beginning to fall, and with the economic outlook in America reasonably bright, the prospects for zinc are sound. In any event, the price of 11 cents a pound is firm, the imposition of import quotas is a favourable factor and, if the automobile industry really does continue its present rate of improvement, the quotation could go higher.

In the UK demand can be called steady. Stocks are nowhere near as high as in the United States, but, then, neither is the demand, and, in addition, it is not quite certain whether the economy will enter its next phase of expansion without first having to weather a few industrial squalls. One of the chief hopes for the world-wide position of the metal is that the US Government will institute some form of barter programme which will help to shore up the zinc price outside America.

Lead is a much better market in America than in Europe. Nevertheless, demand is reasonably steady and it will take less of a revival in demand for lead than for zinc to set the market on its former firm basis. Meanwhile, stocks are available to meet all demands and the prospect for the metal hinges to some extent at any rate on America instituting a barter programme to include lead. The US price is 13 cents a pound.

Tin is making good progress on both sides of the Atlantic, although the actual level of demand is not high. In the US consumption in August was about 5 per cent. higher than in July and it is expected that the September and October figures will show that the rate of improvement has been maintained. This is probably all that is needed at the present time as the restrictions on exports have cut down drastically the tonnage of metal available anywhere. In the East consumer buying is sufficiently steady to indicate that not much metal will be left by the time the present quota period ends. In the United States the price is now over 98 cents a pound.

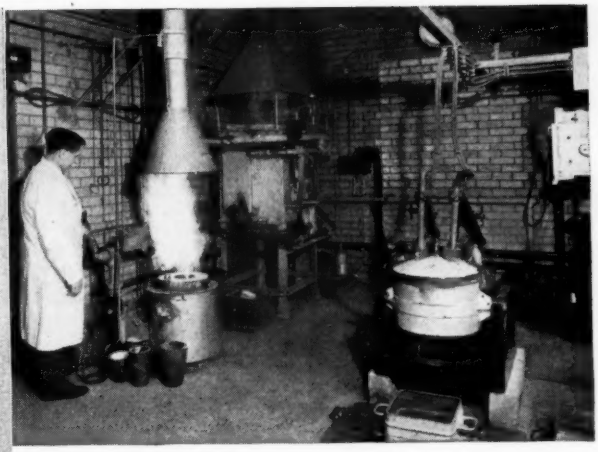
The 53-day-long strike on the Northern Rhodesian Copperbelt ended on Tuesday night, when all the striking branches of the European Mineworkers' Union voted to return to work yesterday (Wednesday) morning. The strike, which followed a demarcation dispute, was settled after two days of high-level negotiations in Kitwe.

Copper has been living very well off the continuation of the strikes in Canada, on the Copperbelt, in the US at the El Paso Refinery—the strike at the Chino being reported as settled—and on the current high level of demand in the US, the UK, and on the Continent. Indeed, US producers are now saying they have very little free metal available, and although the Chilean mines are working to capacity, the metal so produced has most likely all been sold forward. The present spate of strikes has been costing the world at least 50,000 tons of copper a month, so that even the rumour that the Board of Trade was going to release metal from its stockpile was quickly shrugged off. Kennecott and other US producers have gone back to working a seven-day week, which will add approximately 24,000 tons more copper a month to world supplies. In the US the custom smelter quotation still stands at 30 cents a pound and the producers' price at 29 cents a pound, with demand tending to be concentrated on spot supplies from custom smelters.

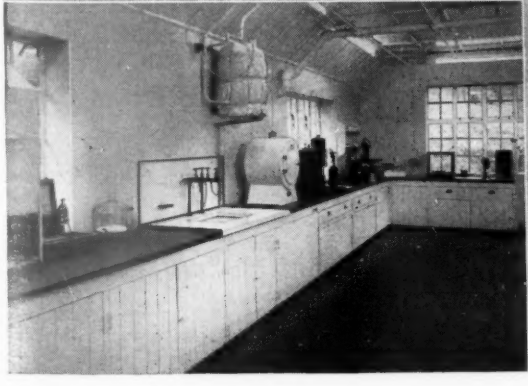
"Clear the Air" Exhibition

A "Clear the Air" exhibition was opened last Monday by Lord Mills, Minister of Power, in the hall of the Royal Society for the Promotion of Health at 90, Buckingham Palace Road, London, S.W.1. It remains open to the public until November 14, except for Saturday, November 8. There are *inter alia* exhibits from the British Electric Development Association; the Department of Scientific Research (the Fuel Research Station); the Gas Council and the Solid Smokeless Fuels Federation. This exhibition is not just another on "Clean Air" but rather, as the title suggests, an exhibition to clear the air about the operation of the Clean Air Act.

Finding the answer to your problem



If you should be faced with a technical problem in connection with casting defects in foundry sands, you are invited to call on the facilities of our experimental foundry and sand testing laboratory.
In addition, our foundry technicians will be pleased to visit any foundry man who might wish to discuss a particular difficulty on the spot.
These 'Fulbond' services are offered without charge and are, of course, entirely confidential.
If you will kindly telephone or write to us, we shall be very pleased to co-operate in finding the answer to your problem.



THE FULLERS' EARTH UNION LTD.

Patteson Court,
Nutfield Road, Redhill, Surrey.
Telephone Redhill 3521

CMF 44

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

November 5, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £44 0s. 0d. to £44 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £58 0s. 0d. to £62 10s. 0d., scale 16s. 0d. to 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 0d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £83 10s. 0d. to £87 0s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £79 10s. 0d. to £85 0s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C* 1s. 9¾d. to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £73 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £258 0s. 0d. to £258 10s. 0d.; three months, £240 0s. 0d. to £240 10s. 0d.; settlement, £258 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 4½d. per lb.; rods, 262s. 6d. per cwt. basis; 20 s.w.g., 298s. 0d. per cwt.

Tin.—Cash, £750 10s. 0d. to £751 0s. 0d.; three months, £750 0s. 0d. to £750 10s. 0d.; settlement, £751 0s. 0d.

Lead (Refined Pig).—First half November, £75 0s. 0d. to £75 2s. 6d.; first half February, £75 0s. 0d. to £75 2s. 6d.

Zinc.—First half November, £71 5s 0d. to £71 10s. 0d.; first half February, £69 10s. 0d. to £69 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £107 5s. 0d.; rolled zinc (boiler plates), all English destinations, £105 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £94 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; sheets to 10 w.g., 205s. 3d. per cwt.; wire, 2s. 8§d.; rolled metal, 205s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £155; B6 (85/15), £200; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £192; HTB2 (38 tons), —; HTB3 (48 tons), £215.

Gunmetal.—BS1400, LG2 (85/5/5/5), £196; LG3 (86/7/5/2), £203; G1 (88/10/2/½), £265; (88/10/2/1), £254.

Phosphor Bronze.—BS1400, PB1 (AID released), £284 per ton.

Leaded Phosphor Bronze.—BS1400, LPB1 (1060), £210 per ton.

Phosphor Bronze Strip, etc.—Strip, 299s. 3d. per cwt.; wire, 4s. 2d. per lb.; rods, 3s. 5d.; tubes, 3s. 5d.; chill cast bars: solids 3s. 4¼d.; cored 3s. 5¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £78 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.: aluminium bronze (BS1400), AB1, £234; AB2, £256.